Inertia Dynamometer Control System

Manual version 2.1.0

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Introduction

Dynertia dynamometer interface kit allows easy DIY construction of an inexpensive inertia dyno. Perfect for any one interested in engine/vehicle testing and modifying, whether it be car, bike or even model sized engines.

An inertia dyno operates on the principle of calculating the power required to accelerate a known mass, which is basically just a 'flywheel' coupled to the engine or vehicle. The controller senses the velocity of the rotating mass, handles the precision timing required (1 millionth of a second) and outputs this data to the PC for analysis and storage.

The included 'Dynertia' software package handles all the functions required of dyno control: setting up, saving runs, correcting for atmospheric conditions, filtering, displaying data, printing, overlaying and analyzing multiple runs.

Even a reflective optical rotation sensor is incorporated into the controller. You simply attach a ‘target’ of adhesive reflective tape (supplied) to the 'flywheel'. No need for additional expensive 'hall' or 'inductive' speed sensors and their associated precision ‘trigger wheels’. This method is both accurate and easy to incorporate into your dyno design.

We also provide a comprehensive guide to assist in the designing and building of the inertia assembly, regardless of it being an engine dyno or chassis style. All you need in addition to this controller and the inertia mass is a PC with a USB port.

The optional ‘DataPAC’ accessory can be plugged into Dynertia and this allows the addition of 5 data channels that can be used for sensors such as air fuel ratio, exhaust temperature, pressure etc

Features-

Software provided handles all data management, analyzing and graphing required for your dyno project with powerful features yet a ‘clean’ interface. Both Metric and Imperial modes are provided, Power, torque and setup parameters are changed from kph/Kw/Nm/ºC to mph/Hp/Ft Lb/ ºF etc.

Integrated optical sensor (reflective) has software sensitivity adjustment and an audible tone for diagnostics.

No external power supplies required, only a single USB connection (with automatic hardware detection) making it perfect for portable applications.

Accuracy only limited by mechanical system variation, internally each rotation is timed to 1µs (1 millionth of a second).

Max speed greater than 150,000 rpm, Min approx. 4 rpm (max rpm >35,000 with DataPAC connected).

Compact, approximately 171L x 25W x 25H (mm) and mounting bushes ('through holes') incorporated for easy adapting to your design.

Suitable for chassis and engine inertia dyno designs, either direct or indirect drive to the inertia flywheel.

Inertia value for up to 3 flywheels can be stored and easily selected for designs with adjustable Inertia mass to tailor to engine characteristics.

Comprehensive Manual provided, also design & construction information is available for the mechanical dyno system, including an Excel spread sheet to assist with choosing and calculating the moment of inertia for your requirements.

No ignition system adapters needed for rpm reading. Determines engine rpm from flywheel rpm by ‘learning’ their relationship (ratio). Up to 8 gears can be learnt and later selected for quick testing in any gear; the ratio can also be manually entered if no tachometer, simply based on number of sprocket teeth (e.g. for chain drive kart engine dynos).

Flexible options for performing a test; a run can be from ‘start’ command to ‘stop’ command or from ‘start’ command to zero power. A minimum speed can also be specified and data below this will be discarded, this eliminates any different start points of tests due to operator error.

Designed to perform testing quickly- common user settings are saved to reduce set up times and any personal notes you’ve entered in the provided form (general, vehicle, owner details etc) can be saved as a ‘template’ and applied to other runs to save re-entering the details, even copies the run’s set up details. Files can also be set to ‘auto name’, the file name simply increments with each test, no need to even re-enter a name.

Rpm or speed is displayed on a ‘real time’ gauge during testing or setup, can be disabled for high speed testing on older computers.

‘Auto Load’ your graph after a run – can be selected to automatically switch to the graph display after each run or you can opt to do as many runs as you like in quick succession and analyse as a graph later. A brief test summary is also immediately available after each run.

User selectable ‘Trace Shift’, the last five trace sets are always displayed (each new test trace ‘shifts’ the oldest one out of selection) - great when performing comparisons.

Overlay up to 5 power and torque graphs simultaneously, including the ‘last run’ which automatically appears after your run is completed. Trace color sets are user selectable, however ‘last run’ always graphed in red for quick identification.

Up to 4 sets of runs can be merged to create a brand new 'averaged' run. Perfect for getting the most from analysis. The new generated file appears just like any other in Dynertia. Comments are automatically attached that reveal the individual runs that it was generated from for future reference.

Graphs are fully auto-scaled, Power, Torque and RPM scales are automatically configured for optimal display.

Full manual ‘zoom’ available on Power, Torque and RPM displays to display selected graph regions of interest or to adjust the graphs appearance to your preference for printing.

Analyse and compare test results by easily ‘hiding’ any particular trace or quickly replacing with other saved runs for comparison.

Features (cont.)-

Onscreen graph legend to rapidly identify trace set colors and filenames and a run summary is available to give the key data for all the selected runs in one concise table.

Select a graph trace; an onscreen cursor makes the dials (power, torque and rpm/speed) display exactly what was happening at that point in the run. There's even an auto re-run of data ('play back' function) that will automatically move the cursor to replay the run (speed user adjustable).

All dial gauges have digital displays incorporated and controllable 'peak' recording needles to hold the maximum values.

Select any two rpm/speed points and the time between them is shown for all runs (up to 5), clearly reveals 'real world' acceleration improvements after modifications.

Click on the run of interest to show all the data that relates to it. The test conditions, max readings, set up details or any of your personal notes that are saved along with each run can all be reviewed.

Color print outs of your chosen graph or overlaid graphs (up to 5 printed on same graph) is only a mouse click away, complete with preview. A report page is also generated that has a summary of all the important test conditions, max readings, date, time, company logo, graph notes etc.

Printouts includes trace sets legends, colors and filenames, the graphs 'grid lines' can even be turned off!

Full data table display of 'point by point' power, torque, rpm and speed are produced for detailed study and can be exported directly into Microsoft Excel (with field headings included) or a text file (comma delimited ASCII) can be generated, even the main graph view can be exported as a bitmap image ('.bmp') for further analysis and file sharing.

Advanced previewing function ('File explorer') shows graphs, summary details and the data table of all saved runs, this allows quick selection for loading into the main graph screen or for file management purposes. A cursor is even available to highlight points of interest on the graph and indicate that location in the data table- no more browsing through cryptic file names!

User configurable directories- have as many separate directories to store your runs in as required.

File protection can be applied to prevent individual files from being accidentally changed or overwritten if required.

Data corrected for weather conditions with world standards (SAEJ607, SAEJ1349, DIN70020 or uncorrected). The environmental conditions and resultant correction factor are stored with each run.

Data 'Smoothing' that is applied to the recorded data is adjustable to ensure you don't miss out any detail but still end up with optimal appearing graphs.

Dynertia will still allow files to be analyzed without the hardware being connected, good for working 'off-line'.

A 'system in motion' voltage output is available that is active as long as the flywheel is rotating, this can be used for safety control systems/warnings if required or for automatic fan controls etc.

An 'Auto Brake' or 'User controlled' voltage output is available that can operate an automatic brake (e.g. eddy current) for slowing the flywheel down if you wish, or an automatic cooling fan for cooling friction style brakes. The time it's active for after a run is adjustable in the software. The output can alternatively be operated by manually selecting (If not allocated to a brake); this would be perfect for remotely turning on a cooling fan etc.

Updates to the basic software will be available FREE to owners as we continually seek to improve our product.

Dynertia has a digital expansion port on the rear; this allows additional features to be added inexpensively in the future via the high speed data connection.

Connection of the optional 'DataPAC' unit allows data acquisition of 5 analogue input voltages to be incorporated. This allows the monitoring of variables such as air fuel ratio, exhaust temperature etc. 2 input channels can be overlaid on the main graph, alternatively all 5 channels can be displayed simultaneously and analyzed in the separate 'single trace' screen. A cursor and 'floating' data box show the values.

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Software Installation

There are basically two parts to the install, the actual Dynertia software and also a 'driver' needed for the USB connection to your Dynertia hardware. Just follow the steps below-

Step 1: DO NOT plug in your hardware, DO close all windows programs.

Step 2: Windows Vista installations require you to read ahead to "Installation notes" first, insert the Dynertia software disc and simply execute the program "Dynertia Installer.exe" and follow the prompts-

DYNertia2 Install Program - Welcome
DYNertia2
Welcome to the DYNertia2 Install program.
This program allows you to install DYNertia2 on your hard drive.
It is strongly recommended that before proceeding, you ensure that no other Windows programs are running.
If you do not wish to install DYNertia2, click 'Exit' now, otherwise click 'Next' to continue.
< Back
Next >
Exit

Read and follow the prompts. You'll be asked to select a folder in which to copy the files.
We recommend you allow the default directory, but feel free to choose any.

Step 3: After the main installation above is completed you will be then be guided through the USB driver installation, the screen shown below appears, **if the screen is not visible** then make sure it is not 'hidden' behind any open windows (like 'explorer'). Please jump ahead to "Installation notes" if there are any problems at this stage.

DYNertia2 - USB Driver Installation
DYNertia2 will now open the installation dialogue box for the USB Driver System.
Click on the INSTALL button (as shown in the graphic)
The Installer will "grey out" its buttons and check wether suitable drivers are already installed OR install the required new drivers (Will take a few seconds...)
After Driver Installation DYNertia2 requires the computer to be restarted so that the required settings can come in effect.
Continue to USB Drive Install
Setup V1.40
Device Driver Install / UnInstall
Select INF File :
USBSER34.INF
INSTALL
UNINSTALL
HELP
WCH
USB-SERIAL
09/24/2007, 2.8.2007.09
This graphic is for illustration only

Read and follow the prompts.

DriverSetup
The drive is successfully Pre-installed in advance!
Please insert the device. And select automatically install in the <Found New Hardware Wizard> dialog box,
ignore the warning of <windows logo testing>,
click the <Continue Anyaway> button until finishing.
OK
HELP

When this window appears, just close it and the one beneath it and **reboot the PC** as instructed.

Full installation is now complete!

There will be a desktop icon created for you and Dynertia2 will appear in your PC's program list, along with its uninstalling program that will remove the software from your PC (delete the 'DYNertia2' folder also after running uninstall).

DYNertia is unable to locate its hardware.
Please install the hardware and ensure the Communications System is correctly configured.
Without the Hardware being correctly installed, DYNertia can only be used to view existing runs.
To purchase DYNertia Hardware :
go to - www.dtec.net.au
Continue showing DYNO & DATA information
Continue showing DYNO information only

When you first run Dynertia2 you will be shown this screen. Press either button, when Dynertia2 opens please plug in your hardware, select the menu options "Setup/Hardware" and configure the port interface (as outlined in this manual)

This screen will also appear whenever Dynertia2 is started and the hardware is not connected or configured. Pressing the appropriate button allows you to continue to use Dynertia2 to view and analyse data 'off-line'.

Installation notes-

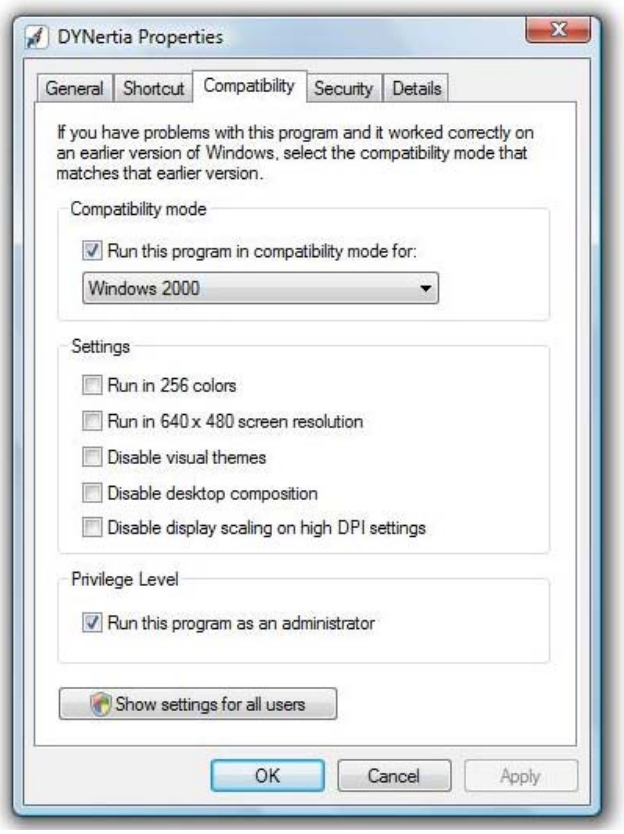
Most issues with the install revolve around the wide variety of PC's in the market and the any versions of Windows and its security settings, Vista operating systems can be particularly troublesome!

Possible Windows Vista errors:

- Installation not allowed by Vista security (messages could relate to administration rights)
- "Error in Dynertia Configuration File" warning when opening

A 'configuration' file error appearing the first time Dynertia is run can occur as Windows Vista attempts to block Dynertia from creating and saving its information files.

Vista has many inbuilt security features; here are some handy hints to help you live with Vista:



'Right click' on the Dynertia icon (or program), choose "properties", select "compatibility" tab and then set "compatibility mode" to run as Windows 2000, also tick "privilege level" to run as an administrator

Your User Account Control (UAC) can also block programs; 'Left click' the Windows icon for 'start', select "control panel", select "user accounts and family safety" (or "administrative tools" if Vista is set in 'classic view'), choose "user accounts" and turn the user account control off (un-tick the box).

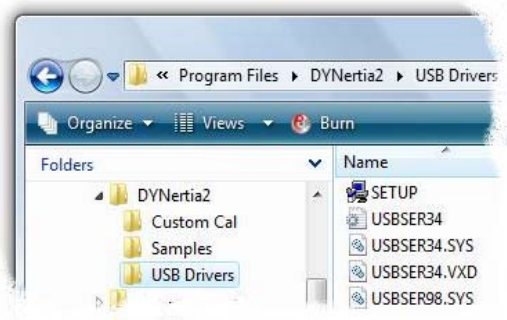
« User Accounts ▸ Turn User Account Control On or Off
Search
Turn on User Account Control (UAC) to make your computer more secure
User Account Control (UAC) can help prevent unauthorized changes to your computer. We recommend that you leave UAC turned on to help protect your computer.
Use User Account Control (UAC) to help protect your computer
OK
Cancel

Installation notes (cont.)-

Possible USB installation errors:

- Hardware was plugged in before the install (read step 1 again!).
- USB installation menu does not appear.
- PC asks for USB drivers even though installed

Don't worry! The USB drivers are in the newly created Dynertia folder (shown below). Just restart the PC, if the USB driver screen is now present then press the "install" button, if not then plug in the hardware, Windows should automatically detect it and check the drivers are installed, if not, a Windows menu appears and you can allow the PC to search for the driver amongst your files.



If a different USB port is connected to (or a USB 'hub') than has been configured, Windows may ask for the drivers to be installed again even though you have for another port. Just do as above and allow the PC to search for the driver amongst your files.

If all else fails:

An uninstall program is provided in your PC's programs list. If there are any installation issues with Dynertia then we suggest you simply uninstall using the "Uninstall Dynertia" program and try again (delete the "DYNertia" folder from your PC also after running uninstall).

If you have any problems then please contact us for assistance!

System requirements-

Dynertia is a hardware AND software system. One will not fully work without the other. This manual is freely available for download from the DTec website (www.dtec.net.au). The interface unit and software must however must be purchased-once again from DTec.

Dynertia is a 'WIN32' application, it should therefore run on Windows 98, ME, 2000, XP and Vista. Earlier operating systems (such as Windows 95) may encounter issues with compatibility as they may not have the required USB hardware and support. Dynertia interface unit derives its power from the USB port (this is common practice). The interface can run on USB1 or USB 2 ports. However, a small number of older USB 1 systems have limited power supply capabilities; this can be remedied by using a powered USB hub in this unlikely situation.

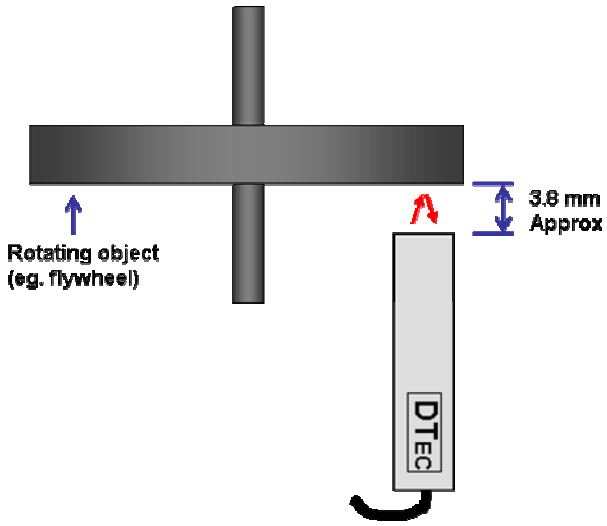
A minimum screen resolution of 1024 x 768 is required to fully fit Dynertia. A smaller resolution will result in part of the display being outside the viewable area.

Although Dynertia has been tested on older, slower computers you will still encounter issues if you insist on using some 'cobbled together' PC that has an incomplete, modified, non-standard or corrupted operating system. If you are experiencing particular issues then we suggest you try on another PC to confirm the operation.

Hardware

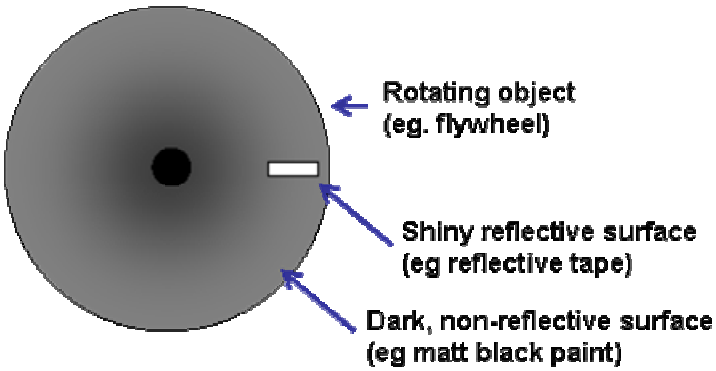
Setting up the Hardware-

Dynertia times the rotational period of a component by sensing its position optically. The sensing 'face' contains an infrared (invisible) light transmitter and a matched detector. The light beam is reflected from a suitable object (normally reflective tape attached to the rotating 'flywheel') and processed to trigger the timing procedure.



The sensor face should ideally be positioned about 3.8mm from the reflective surface being sensed as this is sensors 'focal' point, normally you will find it is not that critical at all!

It is best to ensure the 'edge finder' sound is turned on when doing your initial setup, menu option "setup" then "hardware" and check the button setting. This will allow audible indication that the object is being detected clearly each rotation and not 'double triggering' as indicated by more than one 'click' sound. Obviously your PC will need to have its sound system working to use this feature (don't forget to turn up the volume etc). Turn off feature when finished!

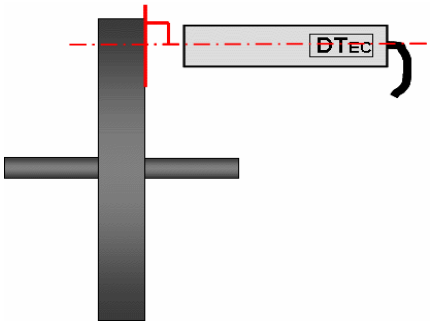


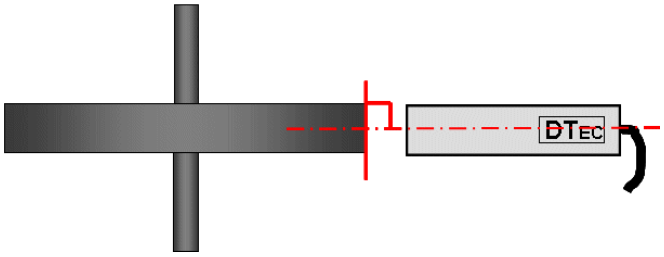
As the sensor relies on reflection it is important to have good contrast between the object being detected and the background. It is recommended to paint the background 'matt black' and use a small strip of reflective tape (cut from the sample provided) as the 'target'. Reflector width is not critical, about 1-2cm is ideal.

Dynertia has a sensitivity adjustment ("Photo Sensor Threshold") in the "setup"/"Hardware" menu. This alters the optical sensors response to reflective and non-reflective surfaces. Higher numbers (range is 0 – 16) increase the sensitivity. For example, if the reflective surface being sensed has a poor finish (badly tarnished perhaps) then the sensor may not detect it without the sensitivity being increased. Care must be exercised when adjusting as an overly sensitive setting may cause triggering from surface features other than the reflector, like the background metal surface! Higher settings will also cause issues if there is direct light (eg. from a flood lamp) present when measuring.

Mounting position of the Dynertia unit depends on the object being timed and its location. The sensor can be rotated at any angle (i.e. there is no 'right way up', the DTec logo can be facing up, down or either side)

The sensor can read off either the face or the perimeter of the rotating object, just ensure the sensor is mounted perpendicular (90º) to the reflective surface being detected.



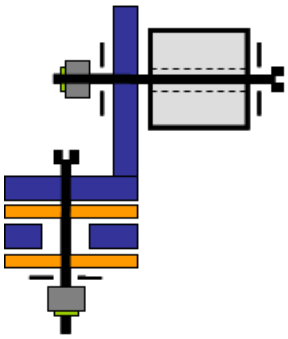


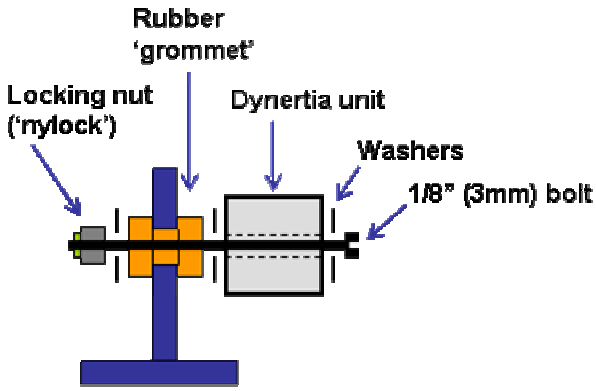
A main requirement is that the sensor is held stable in relation to the sensed object but avoids excessive vibration. The amount of vibration in your dyno will entirely depend on your design, your build quality and the engines being tested.

Strong vibration will destroy Dynertia (as with all electronics) so it is important to consider mounting arrangements that help damped out vibration without allowing it to 'flap around'.

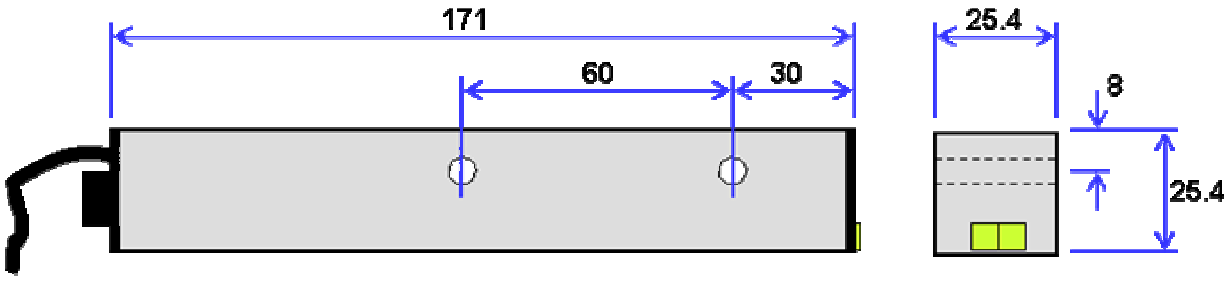
Only fully rigidly mount Dynertia if your design has been tested and your chosen mounting location is vibration free!

Tip- Use can be made of readily available rubber 'grommets' to design a mounting scheme. Lock nut allows the tension to be adjusted against the grommet to control the dampening effect.





Alternatively the unit can be rigidly mounted to a plate and then the plate isolated with soft rubber sheeting to achieve the same result. There are many alternative concepts also in use, one customer has used 'double sided' tape for mounting (its foam backing provides the dampening), another has used industrial adhesive backed 'Velcro'!



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STOP !!!

Important notice

The following operating examples and FAQ's page is designed to save you time in ensuring that you get the most out of your Dyno.

By giving a very brief overview of some main operations we hope to provide a basic concept that will allow easy understanding of the detailed features explained later.

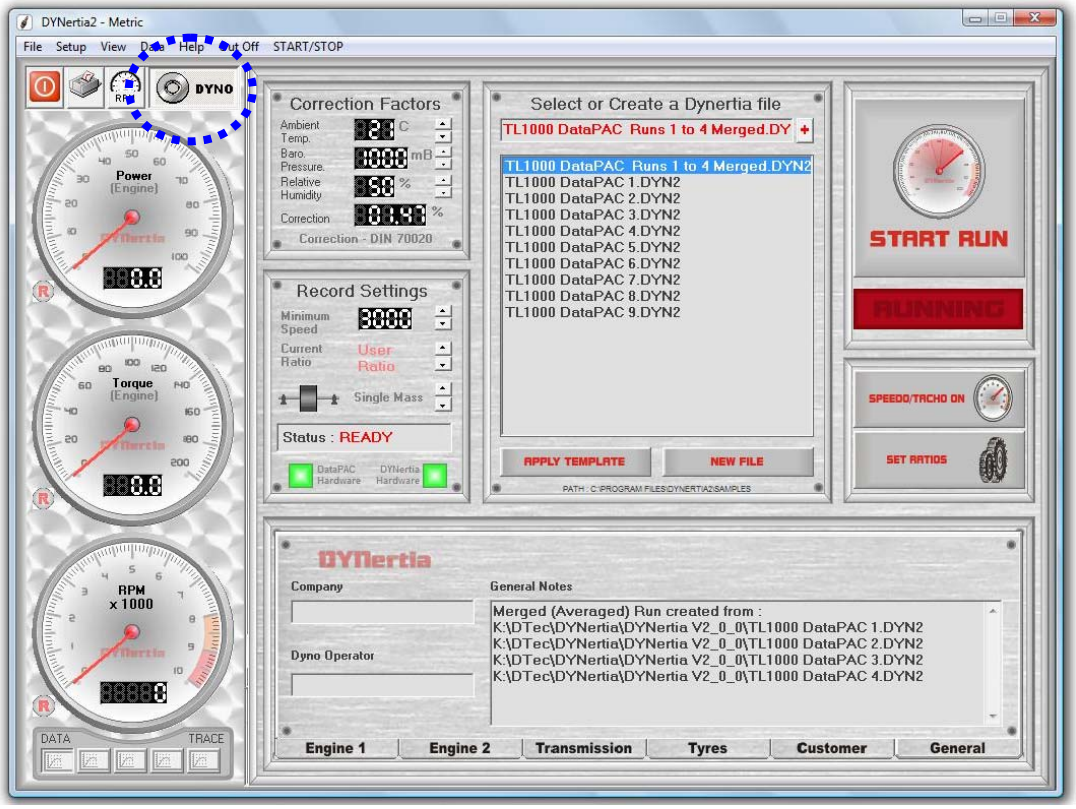
Read this manual fully before operation!

After the examples and FAQ's pages this manual will take you through the functions of the two main screens, 'Dyno' & 'Graph'. Next you will be guided, in the order that they appear, through the selections that are available in the various menu options.

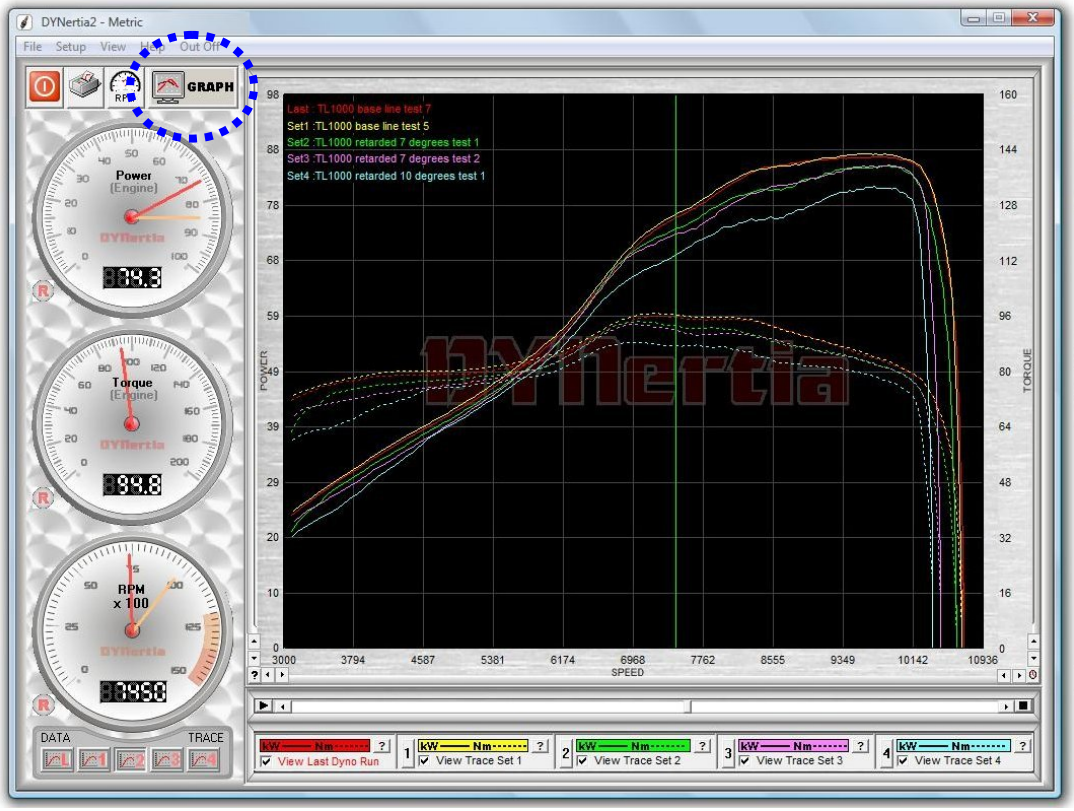
All examples in this manual use 'Metric' units such as kph/Kw/Nm etc. Dynertia can be set in the software to 'Imperial' if you prefer mph/Hp/Ft Lb etc!

Two Main Screens of Dynertia

There are two main screens shown in the software, the '**DYNO**' screen is used to select and create files, enter the weather details, record vehicle test data, 'teach' gear ratios, view rpm/speed and control the testing.



The '**GRAPH**' screen displays the power and torque as traces that can be overlayed and analysed. Traces can be selected, loaded from file and compared.

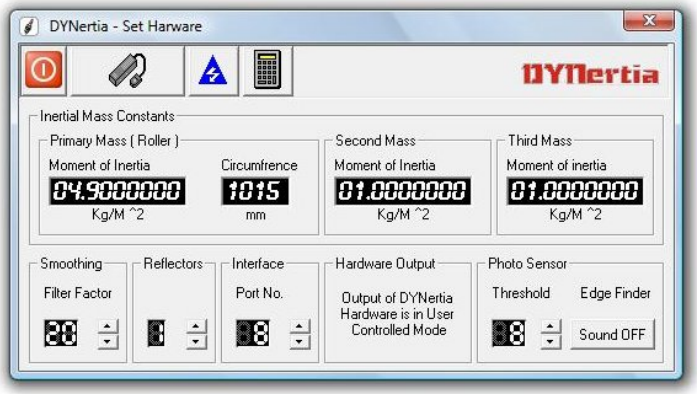

DYNertia2 - Metric
GRAPH
Last : TL1000 base line test 7
Set1 :TL1000 base line test 5
Set2 :TL1000 retarded 7 degrees test 1
Set3 :TL1000 retarded 7 degrees test 2
Set4 :TL1000 retarded 10 degrees test 1
POWER
TORQUE
SPEED
3000 3794 4587 5381 6174 6968 7762 8555 9349 10142 10936
View Last Dyno Run
View Trace Set 1
View Trace Set 2
View Trace Set 3
View Trace Set 4

Example- CHASSIS DYNO Application, Basic Test Run

We will outline the very most basic functions needed for performing a 'run'. As an example we will test a motorbike on a chassis dyno, we will do the test in 4th gear and save the results along with some notes for future reference.

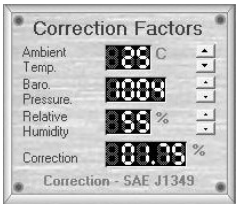
The Dyno has roller/flywheel of 1015mm circumference and an inertia factor of 4.9 kg/m². We will assume that you have read the manual (you have, haven't you?) and the hardware has been adapted accordingly to the dyno. Settings are in their default position.

First time use software setup (setup details will be saved for future testing automatically)-



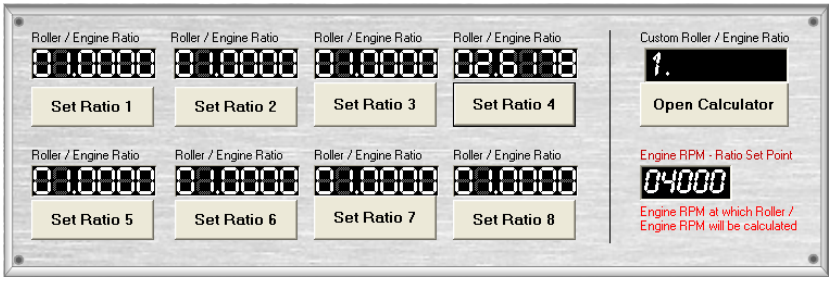
In menu "Setup/Hardware" enter the roller details for circumference (allows accurate display of speed) and Inertial value. With the hardware plugged into the USB port press the 'Auto Find' button or manually enter the interface port number if known, this will teach the PC what USB port is being used by Dynertia.

Performing a basic test on a new vehicle-



Enter the current temperature, barometric pressure and humidity into the 'Correction Factors' box. If you have no weather data then go to menu option "Setup/Software" and select "No correction" in "DYNO Correction Systems".

Teach the Dyno the relationship between engine rpm and roller/flywheel by using 'Set Ratios' button. Run bike up to the 'Engine rpm-Ratio Set Point' in 4th gear (4000 rpm in this example, alter this set point if speed not practical) press 'Set Ratio 4' button. Press main 'Set Ratios' button again to exit.



Enter a file name and press 'New File'.

Set 'Record settings' 'Minimum Speed' to starting rpm for the test and set 'Current Ratio' to "4" as this is the saved ratio we taught as 4th gear.

Press 'Start Run' button (or F12). Snap open throttle (when the 'Minimum Speed' is exceeded recording begins). When the maximum rpm you wish to test to is reached shut off throttle and pull in the clutch simultaneously. Press 'Stop Run' button (or F12) again to end recording.

Add any important comments into the information panel on 'Dyno' main screen for future reference.

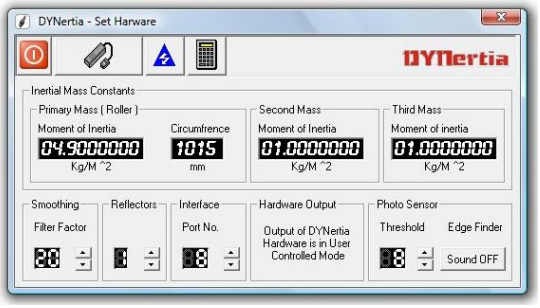
To re-test, just enter a new file name in 'Dyno' screen and press 'Start Run' button when ready.

Example- ENGINE DYNO Application, Basic Test Run

We will outline the very most basic functions needed for performing a 'run'. As an example we will test a go-kart engine on an engine dyno, we will save the results along with some notes for future reference.

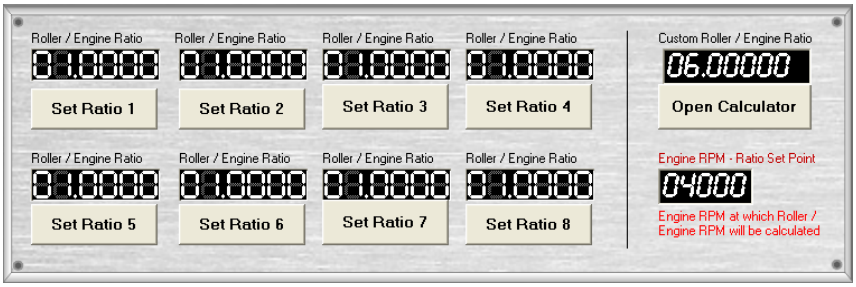
The Dyno has flywheel (inertia factor of 4.9 kg/m²) coupled to the engine by a chain, with a 60 tooth flywheel sprocket and a 10 tooth engine sprocket. We will assume that you have read the manual (you have, haven't you?) and the hardware has been adapted accordingly to the dyno. Settings are in their default position.

First time use software setup (setup details will be saved for future testing automatically)-

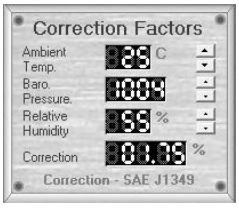


In menu "Setup/Hardware" enter the inertial value. With the hardware plugged into the USB port press the 'Auto Find' button or manually enter the interface port number if known, this will teach the PC what USB port is being used by Dynertia.

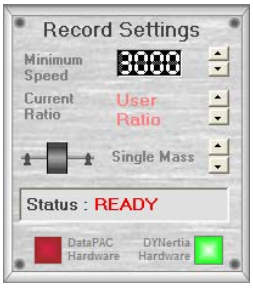
Enter the relationship between engine rpm and the flywheel by using 'Set Ratios' button. In the 'Custom Roller/Engine Ratio' field enter the ratio, this will be sprocket teeth number on roller divided by engine sprocket teeth (60/10= 6). Press main 'Set Ratios' button again to exit. (Alternatively you can set ratio as per chassis dyno example)



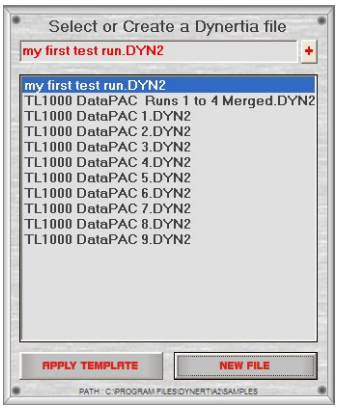
Performing a basic engine test-



Enter the current temperature, barometric pressure and humidity into the 'Correction Factors' box. If you have no weather data then go to menu option "Setup/Software" and select "No correction" in "DYNO Correction Systems".



Enter a file name and press 'New File'.



Set 'Record settings' 'Minimum Speed' to starting rpm for the test and set 'Current Ratio' to "User" as this is the engine to flywheel ratio you have set.

Press 'Start Run' button (or F12). Snap open throttle (when the 'Minimum Speed' is exceeded recording begins). When the maximum rpm you wish to test to is reached shut off throttle and pull in the clutch (if fitted, else overrunning clutch). Press 'Stop Run' button (or F12) again to end recording.

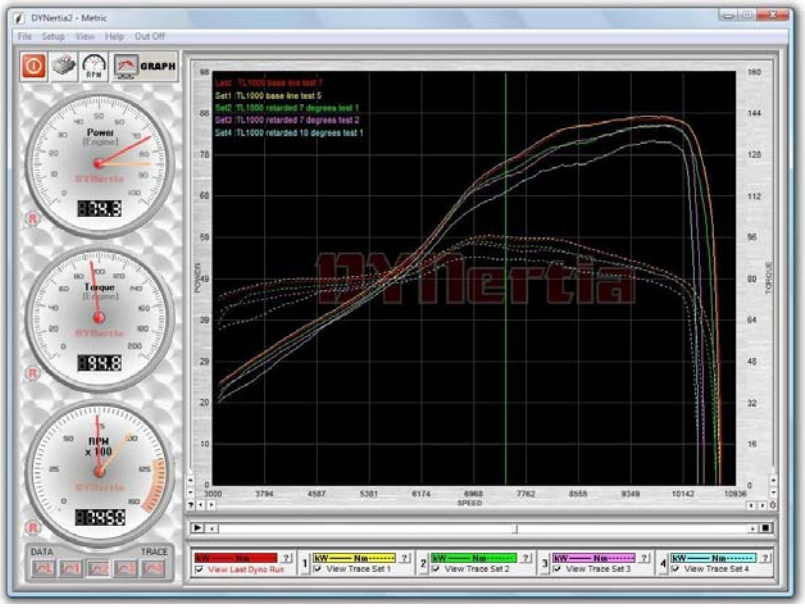
Add any important comments into the information panel on 'Dyno' main screen for future reference.

To re-test, just enter a new file name in 'Dyno' screen and press 'Start Run' button when ready.

Example- Basic Viewing/Loading of Runs

We will outline the very most basic functions needed for viewing, selecting and loading data from runs.

Viewing and loading run data onto the graph screen-



If you have just performed a test then this 'Graph' screen will appear automatically if the menu option "Setup/Software/Auto display of last run" is selected. If not then press the graph button (top LH) of 'Dyno" screen.

The last run you did will appear as a red trace and any others will be shown as various alternate coloured traces.

The scales are automatically set of the highest data values. To 'zoom' in or adjust the scales use the "◄►▲▼" buttons in the graph corners.

To analyse a trace choose the trace of interest by selecting it with the buttons underneath the rpm/speed dial and then 'click' on the graph screen. The coloured cursor (matches selected trace) will indicate via the dial gauges the values present.

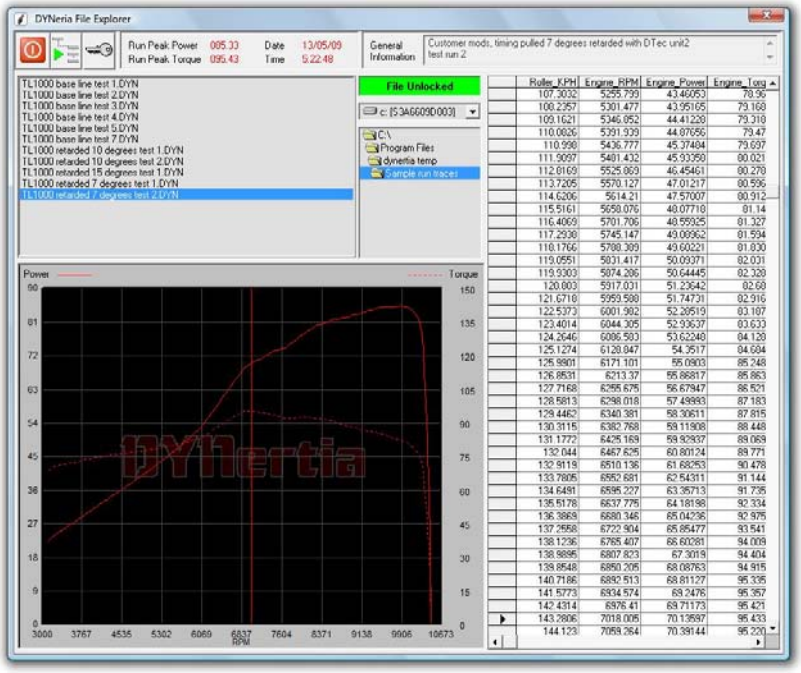
To 'hide' a trace 'click' on its tick box "☑". To change its colour 'click' on the coloured bar. To view associated data and notes 'click' on the "**?**" button.

To load a new file or change an existing one 'click' on the trace number ("2" in this example), this will open 'file Explorer'

In 'File Explorer' you can pick a directory folder of choice and when each file is selected (one 'click') its data table, general notes, key data and preview graph are shown.

If the folder you are viewing will be used regularly then press the 'File Storage' icon (top LH) and it will become the default file path for saving new files into.

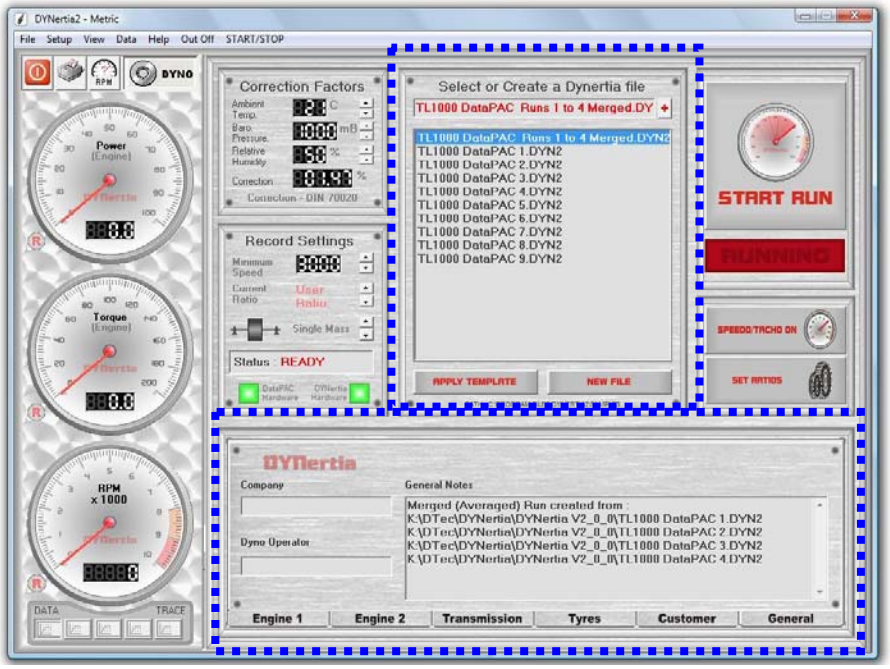
'Double click' on a file of interest and it will be loaded as the new trace set back in the main graph screen!



Example-Basic User Comments & 'Templates'

We will outline the very most basic functions needed for adding user comments to files , editing them, creating and saving a 'template' of these comments and setup data.

Adding and editing file comments (optional)-



There are 78 different information fields, use many or as few as you want!

When a file is selected in the 'Select or Create Dynertia file' panel the file will be highlighted in blue and its title will appear in red in the top window, select any from the list.

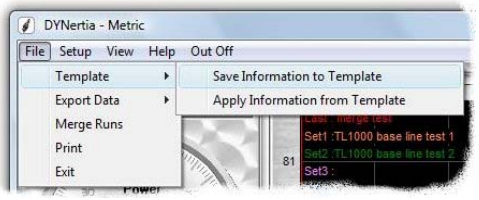
To view and alter comments just select a file, add or change the notes that become visible in the comments panel (bottom RH), that's it!
Notes will now be saved along with that file.

When selected, if the 'Start Run' button (top RH) becomes a symbol of 'keys' it means the file is locked and cant be altered ('File Explorer' screen controls lock/unlock)

To view new folders of files select them with Dynertias 'File Explorer', a short cut from this 'Dyno' screen is by 'clicking' on the text at the bottom of the 'Select or Create Dynertia file' panel.

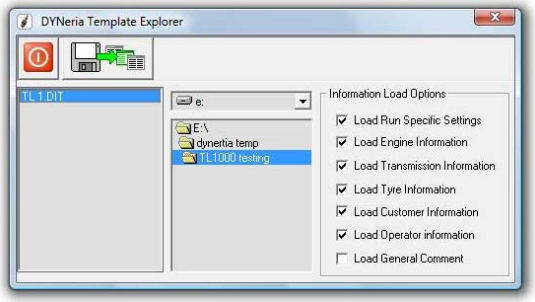
Creating, saving and applying a 'template' (optional)-

If you have entered details into the comment fields (e.g. engine data, customer details, modifications) and you want to apply them to other tests without having to retype your notes, then save it as a 'template'. When notes are saved as a template or attached to a file it will also transfer some dyno settings (gear ratio, weather correction standard, min start rpm and test gear), this is to speed up retesting on vehicles/engines by simply attaching a previous made template, if you wish.

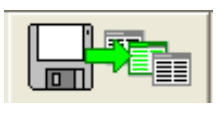


Save with the menu option "File/Template/ Save Information to Template".

To apply it to any selected file use the "Apply Template" button.



When applying a template a screen will appear that allows you to select the information that you wish to attach to the file, press the 'load' button to apply what you have selected.



Frequently Asked Questions (FAQ's)

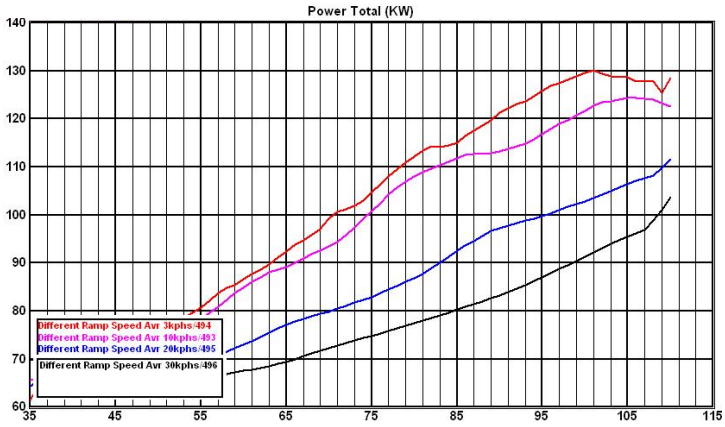
The answers to some commonly asked questions that may increase your understanding of Dynertia and your dyno.

Q- Do I need a tachometer?

A- Not necessarily, speed mode can be used as the graphs x-scale instead of rpm mode; this can be done if it is not practical to use a tacho. Dynertia only requires that the engine rpm be known temporarily for initial 'teaching' (chassis dyno) and any rpm point can be used. If none of these options are viable then simply run the dyno in speed mode as mentioned, Engine dynos normally don't require a tacho due to the known fixed drive ratio.

Q- How does it get engine rpm without ignition connections? Why doesn't hardware incorporate an engine tachometer?

A- Dynertia determines engine rpm from flywheel rpm by 'learning' their relationship (ratio). Any application that has a tacho fitted, or can have one connected temporarily is particularly applicable. Many vehicles tested on chassis dynos incorporate one and there are also many cheap commercial units available. Typical engine dyno's where the gear ratio is obvious (sprocket sizes known or direct drive) do not even need a tacho.
There are many varied ignition systems in use that would require multiple adapters and increase the cost of the basic Dynertia hardware considerably. However, we are currently developing an advanced 'stand alone' unit that may be available in the near future (stay tuned to www.DTec.net.au).



Q- Why do power levels seem to vary if I choose a different gear or why do they seem to differ from what I expect to see when I run an engine with considerably different power ratings. Shouldn't they be the same?

A- Any thing that alters the rate of acceleration of the engine will alter the measured (not actual) power. This is due to the faster acceleration rate resulting in power being consumed in accelerating the engine components (and wheels, chains, sprockets etc) themselves. Just as on the race track in the 'real world'.

This graph shows the same vehicle 'ramp' tested at rates from 3, 10, 20 and 30 kph/sec. This is on a world class 'eddy current' dyno, not even an inertia dyno. It shows the effect of engine/vehicle inertia clearly (faster = lower readings). Unless true 'step' testing (expensive 'brake' dyno) is used this effect always occurs. Inertia dynos give slightly lower overall readings due to this acceleration. Also, manufacturers power figures are often at the crank (no large transmission loses, tyre loses etc), they are often optimistic (marketing department!) and some dynos add 'fudge factors' that raise readings, this can all create an expectation of a certain power level! Try and use inertia values and test gears that don't allow the engine to accelerate too fast (please read the design guide on www.DTec.net.au for full discussions), 8-10 seconds is generally considered suitable for a run.

Q- My dyno doesn't give the same figures as the one up the road. Is it accurate?

A- Accuracy is not really important, repeatability is! Take your bike to 6 different dynos and you'll return with 6 different readings. This doesn't matter, what you need is repeatability so that if you put the bike back onto the same dyno the figures are the same. Without this you can't tune and are wasting your time! Inertia dynos are very, very repeatable! If your customer only wishes to see 'big numbers' and not necessarily 'better numbers' then he may as well just travel around till he finds a high reading dyno (or the operator fiddles the correction factors) and not bother with tuning! If actual reading is a concern consider your choice if inertia mass, test gear or the inertia value entered in the setup screen.

Q- How do I create and rename folders and files for my runs?

A- Windows Explorer can be used just like with any other program.

Q- When I go to view graphs a warning about not being able to load the trace appears, what does this mean?

A- If there is no actual data saved in the file (run not performed) or the file has been renamed or relocated then obviously Dynertia will have problems finding/opening it. If Dynertia can't open all of the files selected for graphing it will clear all so that you can re-select from their new location. If only some runs (not all) won't load then just reload the altered ones again, selecting from the new location. Moving/renaming the 'default' folder being used should be avoided.

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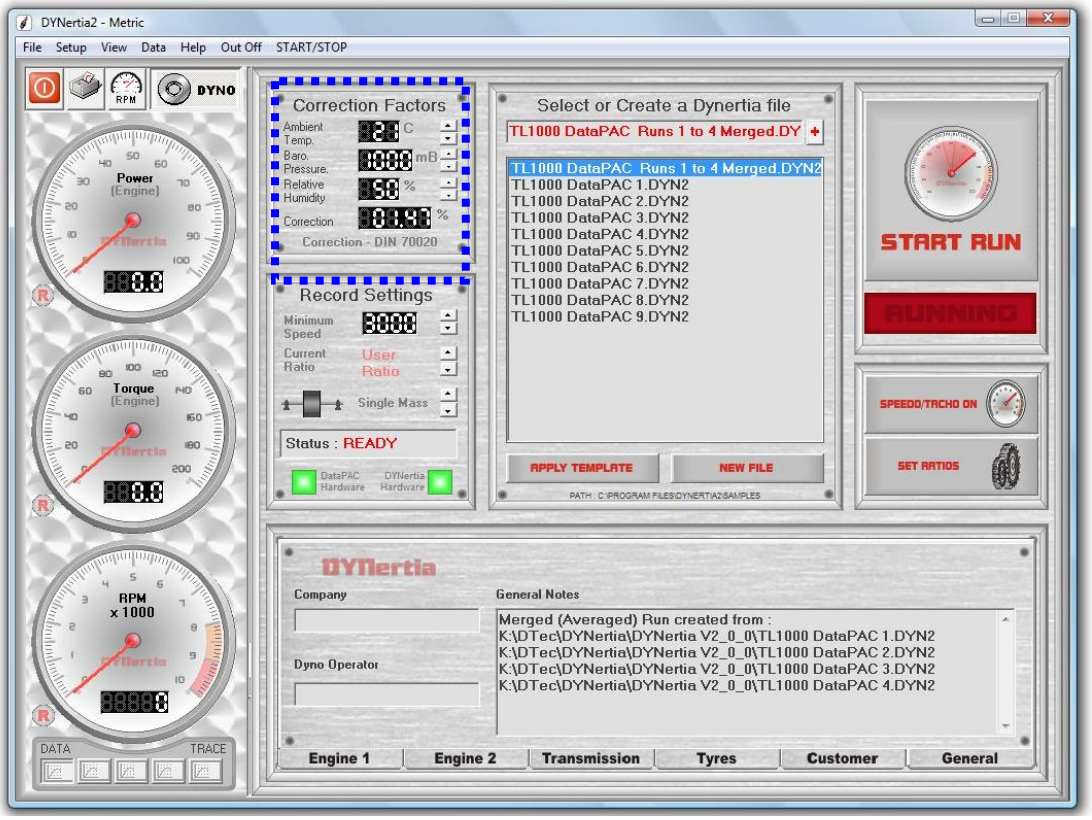
Dyno Screen Overview

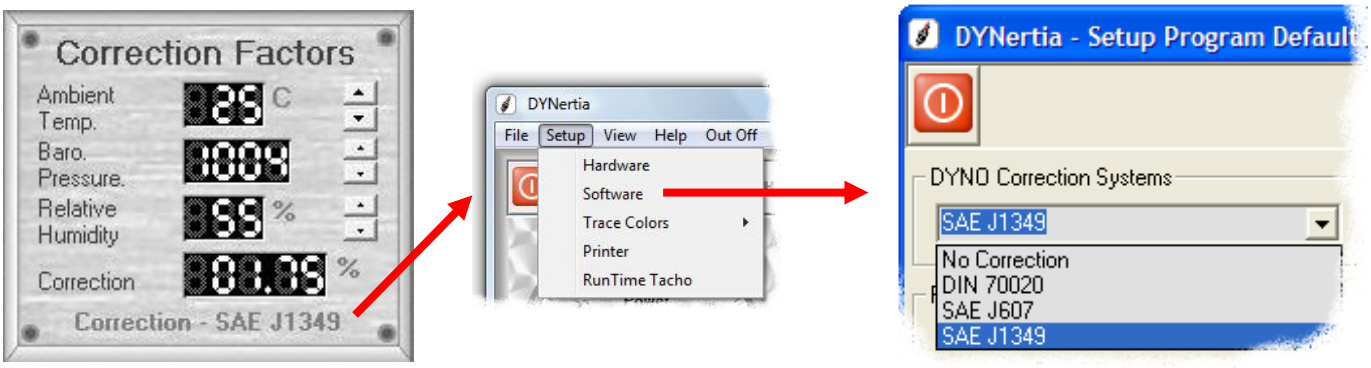
Correction Factors –

The current weather conditions- temp, relative humidity and absolute barometric pressure can be entered so that corrections can be applied to the data. This allows tests to be corrected to a standard set of atmospheric conditions and allows consistency as the environmental test conditions change. If applying then it's important to keep an eye on your weather station (not very expensive for basic units) whilst running tests, you will be surprised how quickly conditions change!



NOTE: Barometric pressure figure used should be 'absolute' and not 'corrected'. Corrected is given in the typical news weather report.

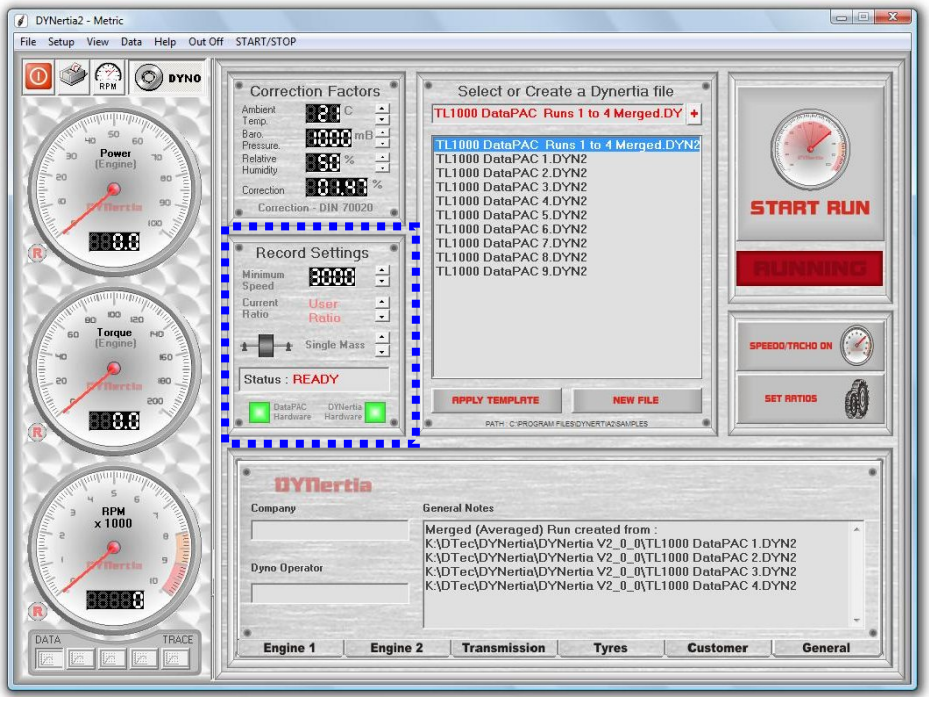
Correction to world standards SAEJ607, SAEJ1349, DIN70020 or uncorrected can be applied via the menu option "setup/software". The correction factor being applied, weather data entered and the selected correction standard are recorded automatically with each test for reference.



Tip- Click on text ("Correction – ") at the panel bottom for a shortcut to "Setup/Software"!

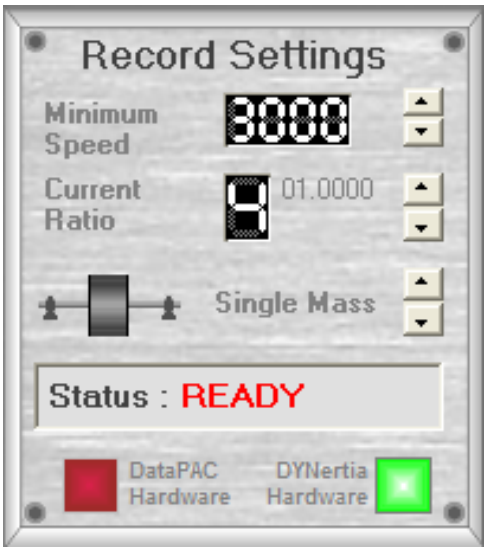
Dyno Screen Overview (cont.)

Record Settings –



Minimum Speed: Is what you want to start the test at- this sets the point that will be used to start gathering data when testing. It is usually set just above the slowest speed that you can hold steady on the dyno before you accelerate for a 'run'. If set too high your graph will simply be missing data below this speed and if set too low then unsightly readings may be visible at the start of your graph due to the engine 'surging' against the flywheel load as you prepare to accelerate. If you have Dynertia set to end a test when negative power is detected then a low setting may also cause a test to end early, this could occur if you decelerate accidentally at low rpm whilst getting ready to accelerate for a test.

Tips- Either rpm or speed are used depending on the operating mode set by the 'mode' tool bar button (icon of gauge, top left of active screen); rpm or speed settings are both stored independently. Click on text for a summary of settings!



Current Ratio: The selection here is used by Dynertia to work out engine rpm by relating it to flywheel rpm and this will depend on the gear being used during testing on chassis dynos.
Set the vehicle gear you wish to test in or select "Roller rpm" if the dyno is directly coupled to the engine (1 flywheel rotation = 1 engine rotation). There is also a "user ratio" option for selecting a fixed ratio, this is used for dynos were the flywheel is indirectly driven by the engine via gearing. Ratio data is set with the "set ratios" button (middle RH side of screen above).

Further details and 'teaching' the gears will be covered under the "set ratios" button description in this manual.

Tip- Click on text for summary of ratios that have been set!

Incorrect setting will result in engine torque being displayed wrongly as it is calculated from engine rpm, power figures will be unaffected as they are based on flywheel rpm.

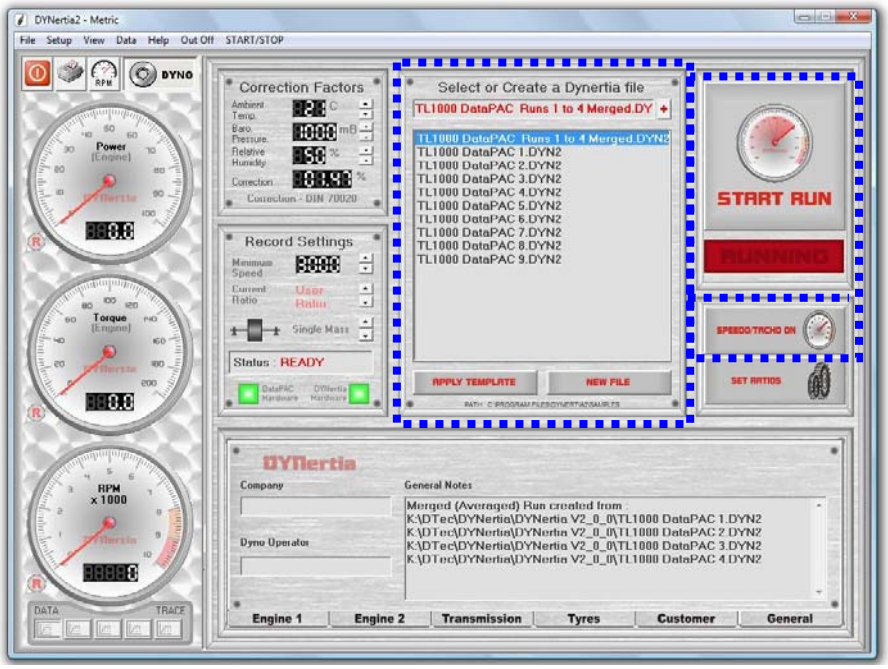
Number of Mass's: If multiple flywheels are used (up to 3) then selecting the number will update the inertia value used in the power calculations, this allows for quicker operation than re-entering the new inertia value each time they are changed. The inertia values are set in the menu option "setup/hardware".

Status: Displays if Dynertia is "recording" data from a run, "ready" waiting for a run or "rpm/speed" if either 'speedo/tacho' or 'set ratios' buttons are pressed (this indicates that the tacho/speedo dial gauge is operational for reference but an actual test run cannot be performed in these modes)

Dynertia Hardware Lamps: Lamps are green when associated hardware has been detected and communication established, red if not. If this is the case, firstly check that the unit is plugged into the computer correctly and then confirm that the "Setup/Hardware" menu has the correct port configuration.

Dyno Screen Overview (cont.)

Select or Create Dynertia file –



New File Button: Allows naming of a file for your test run, it creates a file using the name you have entered into the field. We strongly suggest you use constructive names for your files and group them into meaningful folders e.g. you might have a folder for each customer or vehicle type (use Windows explorer to create folders as required) and when testing you might name the files based on the modification your testing eg. "Long inlet runner_ no filter"

Increment File Name: Optionally will automatically name the next file, no need to even press 'new file'. Numbers will be added to the file name, if the name already ends in a number it will increment this.

File Path: At the bottom of the panel you can see the file path listed, if you click on the text it will take you to the Dynertia 'File explorer' so that you can select another folder to save into and view if you wish. You will also be able to preview the selected file graph, data tables, key data and lock the file so it can't be overwritten accidentally

Tip- Double clicking on any file listed will also open the Dynertia 'File explorer'.

Tip- Once a new folder is chosen in 'File explorer' you will need to press the 'File Storage' (icon with green arrow) button there for it to be accepted! This will make it the default folder.

Apply Template Button: Optionally applies a 'Template' to the selected file. A template is composed of any notes that you have entered into the comments fields (eg. engine data, customer details, modifications) and certain dyno settings. Applying templates saves you having to retype your notes each time if retesting the same engine and allows Dynertia to configure itself based on the previous settings recorded. To save a template for later application enter any data of interest in the comments fields (general notes etc), and then use the menu option "File/Template/ Save Information to Template".

Run Control –

Start Run Button: Starts and stops Dynertia recording data from a test run. This can also be done by pressing 'F12' on your PC. During a run the indicator lamp labelled "running" will flash repeatedly.
The buttons symbol will change from a dial to a set of keys and the text to "Locked" when running a test is prohibited, this happens when 'Speedo/Tacho' or 'Set Ratios' mode is active. A locked symbol will also show that a selected file is protected and can't be altered or overwritten (done in menu option "View/Directory" with the 'key' icon)

Speedo/Tacho Mode –

Speedo/Tacho: Button enables the Speedo/Tacho dial to display live information (i.e. not just for analysing graph traces); this is handy when setting up an engine to confirm that Dynertia is receiving accurate information and that the gear ratio settings are correct (ie. that the ratio of flywheel to engine speed is correct). This mode can also be used to calibrate vehicle speedometers. The dial gauge will display either rpm or kph depending on the mode set by the 'mode' tool bar icon (icon of gauge, top left of active screen).

Tip- When pressed, running a test is prevented!

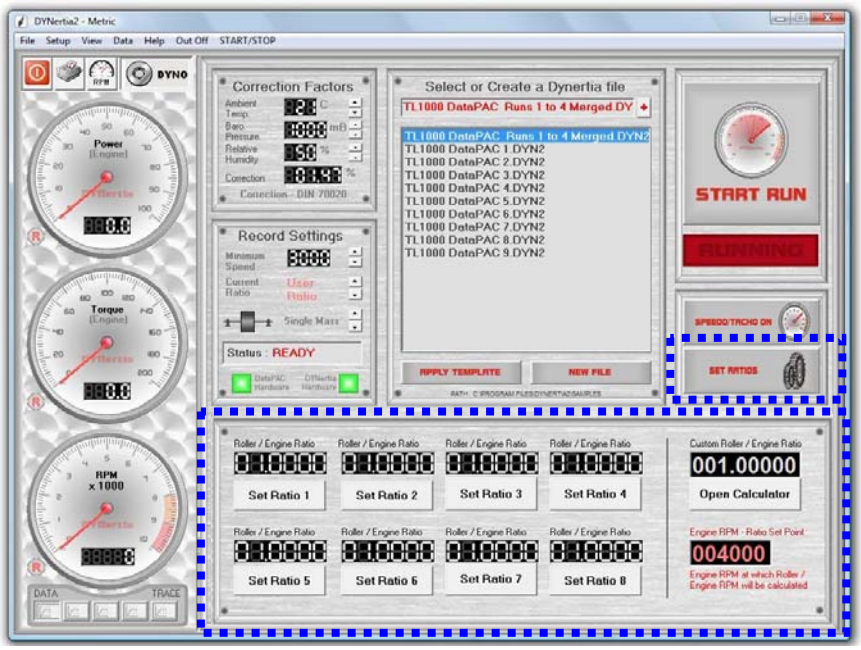
Dyno Screen Overview (cont.)

Set Ratios Mode –

To avoid unreliable and difficult to attach engine rpm sensors Dynertia bases engine rpm on the relationship between the engine and the flywheel rpm. Engine rpm is required for torque measurement.

"Set Ratios" button opens the panel that allows quick setup for any dyno type or vehicle choice.

☝Tip- When pressed, running a test is prevented and the rpm/speed gauge will read rpm only!



Your options depend on the dyno design-

- **Engine dyno, flywheel coupled directly to the engine (1 flywheel rotation = 1 engine rotation)**

No setting required, instead select "Roller rpm" in the 'Record Settings' panel for "Current Ratio".

- **Engine dyno, flywheel driven via gearing (1 flywheel rotation = x engine rotations)**

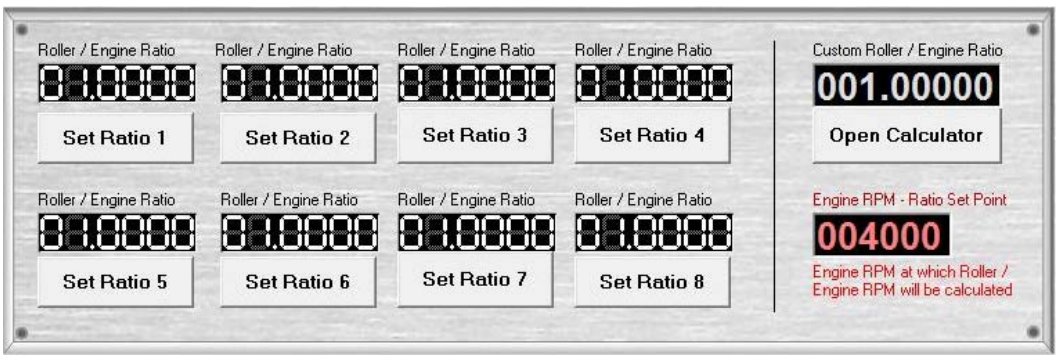
Set "Custom roller/engine ratio" based on the gearing (eg. Number of flywheel driven gear teeth divided by number of teeth on engine drive gear). Select "User Ratio" in the 'Record Settings' panel for "Current Ratio".

If the engine has a tacho another option is to simply use the 'teaching' option below as for a chassis dyno.

- **Chassis dyno (1 flywheel rotation = x engine rotations)**

Dynertia can be 'taught' the relationship (ratio) of flywheel to engine, up to 8 gears can be learnt and later selected in the 'Record Settings' panel for "Current Ratio", allows for very quick testing of the vehicle in any gear.
Enter an appropriate rpm as "Engine rpm- Ratio Set Point", choose a test gear, hold the engine rpm at the rpm number you entered (4000 rpm in example below) and when steady press the 'Set Ratio' button of choice. We recommend you use "Set Ratio 1" for 1st gear etc.

☝Tip- If you know you'll only be testing in one gear then only bother teaching that particular gear.



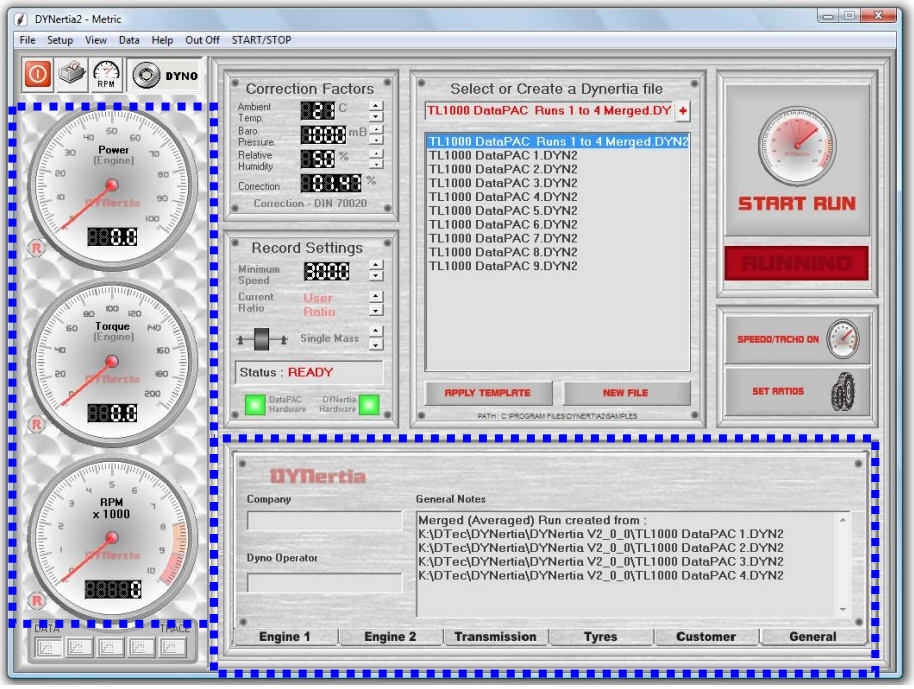
☝Tip- A calculator can also be displayed for general purpose usage.

Dyno Screen Overview (cont.)

Dial Gauge Displays –

Dial gauges are used to show the data values at the cursor when in the Graph screen and analysing runs. The rpm/speed dial can also be used 'real time' during a run or for setup purposes.

All gauges have a peak 'tell tale' needle that can be reset by clicking on "**R**" symbol next to each one. They can be disabled in the menu option "Setup/Software/ Peak Indicators"



Rpm/speed dial: The dial gauge will display either rpm or speed depending on the operating mode set by the 'mode' tool bar icon (icon of gauge, top left of active screen). It is active and displays 'real time' when the 'Speedo/Tacho' or 'Set Ratios' buttons are pressed and during testing (if the menu option "Setup/Software/ Run Time Gauge Control" is enabled).

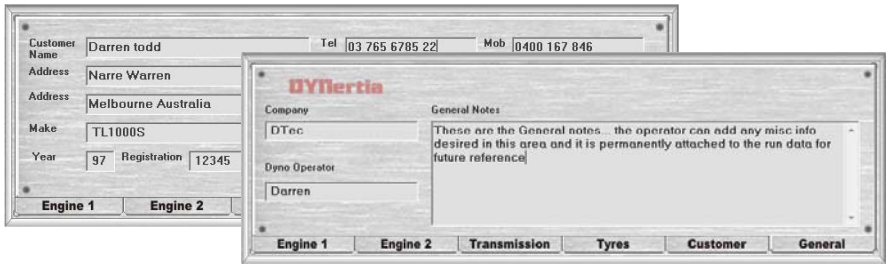
The range of the scale is set in "Setup/Run Time Tacho" when used 'real time', otherwise it's automatically selected based on the scales used in the graph screen.

Power & Torque dials: Only display the measured power and torque when analysing graph traces in the 'Graph screen', they are not 'real time' during testing as this would limit the PC's capacity. Their scale range is automatically selected based on the scales used in the graph screen.

User Comments Field (also 'Template') –

Any notes and data you wish to record can be entered here, including customer information, there are pre-defined fields and a general notes area. The information is stored along with the test data when each run is performed and can be reviewed and altered when a saved file is loaded.

When a file is selected in the "select or Create Dynertia file" panel then the Information fields will show any notes that have been entered for that test. If you enter notes or alter any details then these changes will be re-saved automatically.



Tips- You can lock any file to protect it from accidental change in the menu option "View/Directory" ('key' icon). If a chosen file is already locked when selected, the "Start Run" button changes to "Locked" (image of a set of keys).

If you have entered details into the comment fields and you want to apply them to other tests without having to retype your notes, then save it as a 'template' with the menu option "File/Template/ Save Information to Template". To apply it to any file use the "Apply Template" button. When the information is saved as a template or attached it will transfer some dyno settings also (gear ratio, weather correction standard, min start rpm and test gear), this is to speed up retesting on vehicles/engines by simply attaching a previous made template if you wish.

Tip- A 'Template' of the information can be created and saved without having an actual test file open.

Graph Screen Overview

Tool Bar Button Functions-

Exit: Saves and exits Dynertia.

Print: Opens the printing menu, same as the menu option “File/Print”.

Rpm/speed Mode: Switches the dyno from displaying rpm as the graph X-axis to speed, also alters the rpm/speed dial gauge. Speed is applicable for a chassis dyno when the roller circumference has been correctly entered in the menu option “Setup/Hardware”.

Dyno/Graph: Switches between the Dyno screen and the Graphing screen. Switching automatically to the Graphing screen after a test can be chosen in the menu option “Setup/Software/Auto Display Graph of Last Run”.

Data Trace to Analyse-

Each button selects the data trace on the graph to be analysed (L = Last run). The chosen trace is the one that will have its values displayed by the dial gauges as the cursor ‘cross hairs’ are positioned along it.

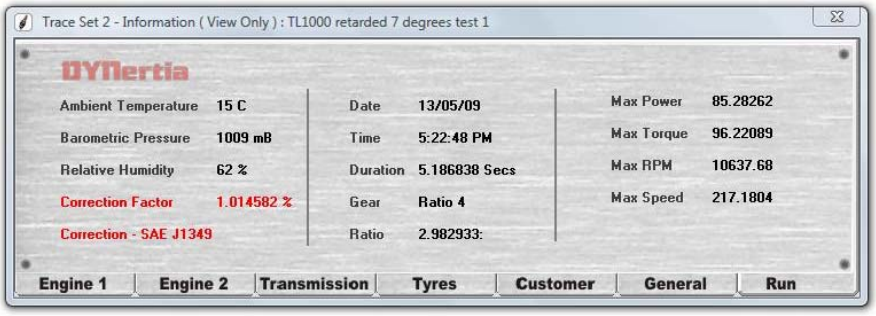
Tip- Cursor colour matches the colour of the trace selected.

Trace Selection-

The individual traces on the graph can be turned on and off (‘hidden’) from displaying (and therefore also printing) with the ☑ tick box.

To load a ‘run’ trace to view click on the trace number button (LH of each panel, in this case trace “2”) and the ‘File explorer’ screen will open to the files location to allow previewing and selecting (by double clicking on it) of any stored run.

The “**?**” button for each trace will display the main test data in summary and any recorded notes can be viewed by selecting the appropriate tab.



If you click on the power and torque coloured header section (green in this example) you can select any display colour from the pallet to associate with this trace number, it will be stored permanently.

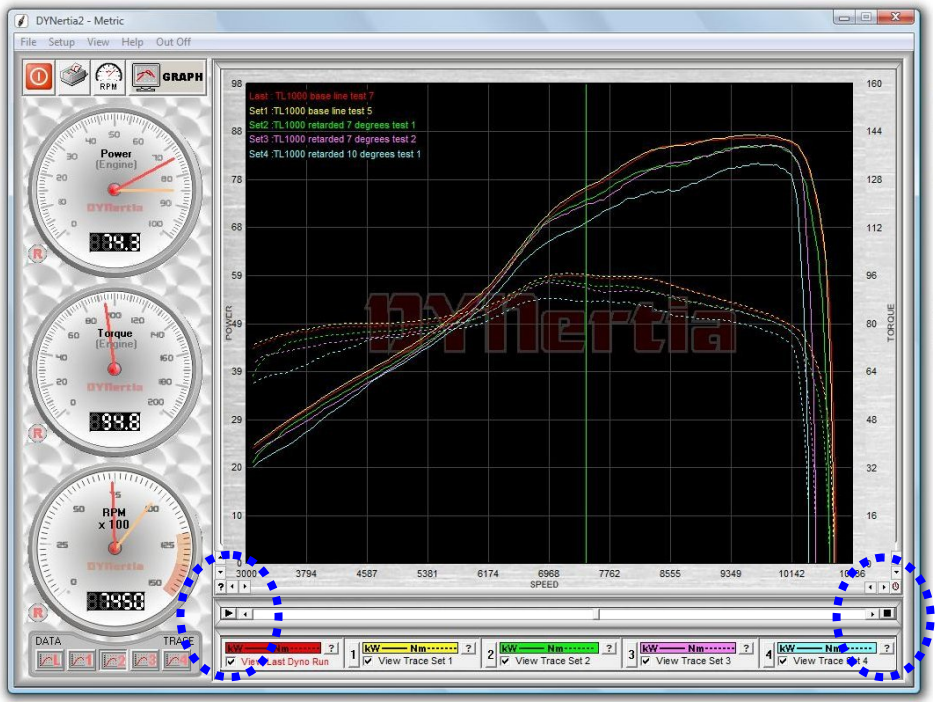
Tip- The colours chosen are also used for printing (on a white background), so keep this in mind and avoid very light colours if printing is planned.

Graph Screen Overview (cont.)

Graph controls-

The horizontal graphs X-scale is either rpm or speed depending on the operating mode set by the 'mode' tool bar icon (icon of gauge, top left of screen).

Based on whichever data trace you have selected (buttons under rpm/speed dial) you can click on the screen to produce a measurement cursor ('cross hairs') that can be moved to any spot by clicking or dragging the 'slide control' at the bottom of the screen. The relevant measurement information will be displayed on the dial gauges.

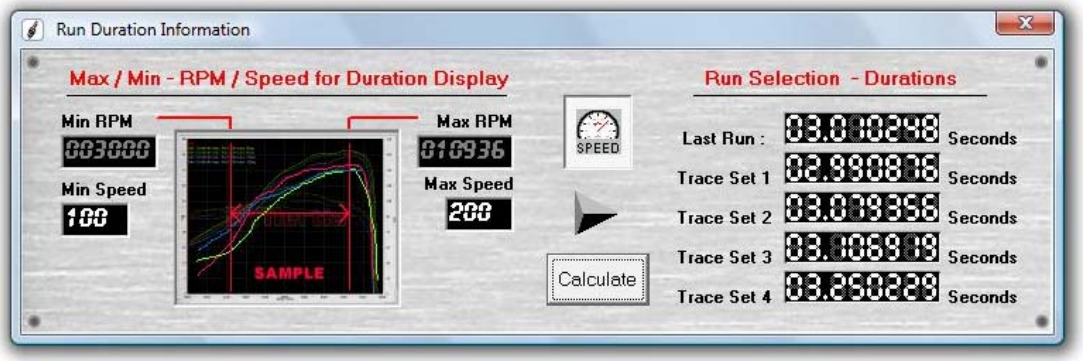


"◄►" buttons (lower LH & RH corners) allows the trimming (or 'zooming in') of the trace image by moving the graph start and finish points, this can also remove any unwanted trace sections, particularly useful for ensuring the printed image appears as you wish.

"▲▼" buttons (lower LH & RH corners) allows the trimming (or 'zooming in') of the trace image by altering the graph power and torque scales, this can also remove any unwanted trace sections, particularly useful for ensuring the printed image appears as you wish.

"► ■" play and stop symbol buttons will allow automatic 'sweeping' of the graph by the cursor; this can be useful to observe the dials peak 'tell tales'. The playback speed can be set via menu options "Setup/Software".

"⏲" Clock symbol button (lower RH corner) will open a panel that allows selecting any two speed or rpm points and displays the time between them, great for showing changes in acceleration rate between tests (i.e. 100 – 200 kph times).



Tip- The two values will initially be selected from the graph scale settings you have chosen (start and finish rpm/speed).

DYNertia Graph Summary (Entire Run)

	Filename	Cirrection %	Min RPM	Max RPM	Max Torque	Max Power
Last Run :	TL1000 base line test 7	1.017517	3000	10721.28	97.85851	86.86267
Trace Set 1	TL1000 base line test 5	1.017517	3000	10697.91	98.60748	87.38233
Trace Set 2	TL1000 retarded 7 degrees test 1	1.014582	3000	10637.68	96.22089	85.28262
Trace Set 3	TL1000 retarded 7 degrees test 2	1.014582	3000	10462.82	95.43307	85.32538
Trace Set 4	TL1000 retarded 10 degrees test 1	1.014582	3000	10371.42	90.08067	81.53534

. "**?**" button (lower LH corner) will open a panel that shows key summary data for all of the loaded traces

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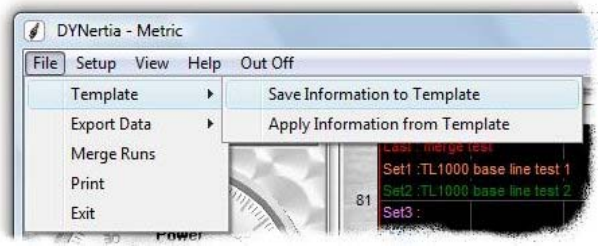
Menu Options 'File'

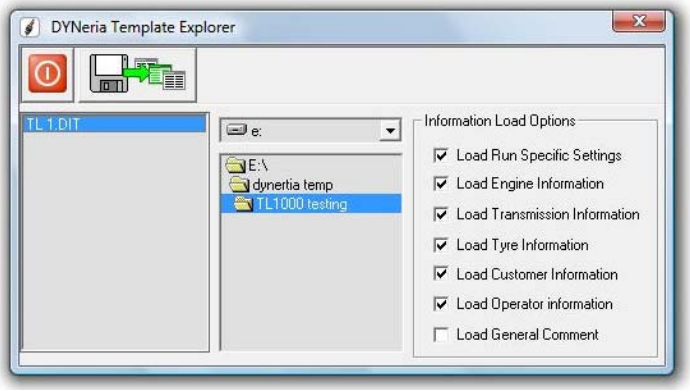
Template-

A 'template' optionally allows the saving of any information that you have entered in the user comments fields so that it can be later attached to any future tests to save re-typing it. The applied information can then be further added to or altered at any time.

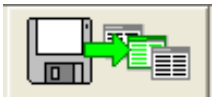
Both applying a template to a file and saving one can be performed here; there is also an "applying Template" button in the 'Dyno' main screen to use.



When the template is saved or attached it will transfer some dyno settings also (gear ratio, weather correction standard used, min start rpm and the test gear), this is to speed up retesting on vehicles/engines by simply attaching a previous made template if you wish. Templates are saved as special files (".DIT").

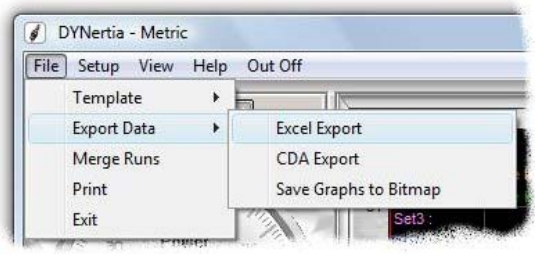


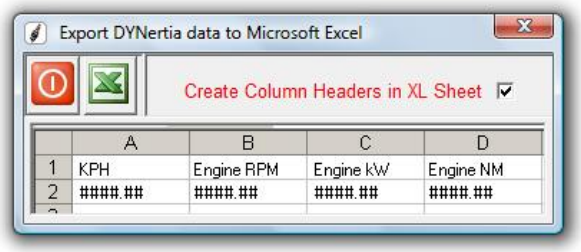
When applying a saved template to a file, a choice of what data entries you wish to attach will become available e.g. you may be testing the same vehicle as previously but wish to only add new general comments due to modifications. Tick the appropriate box's and press the 'load' icon to apply.

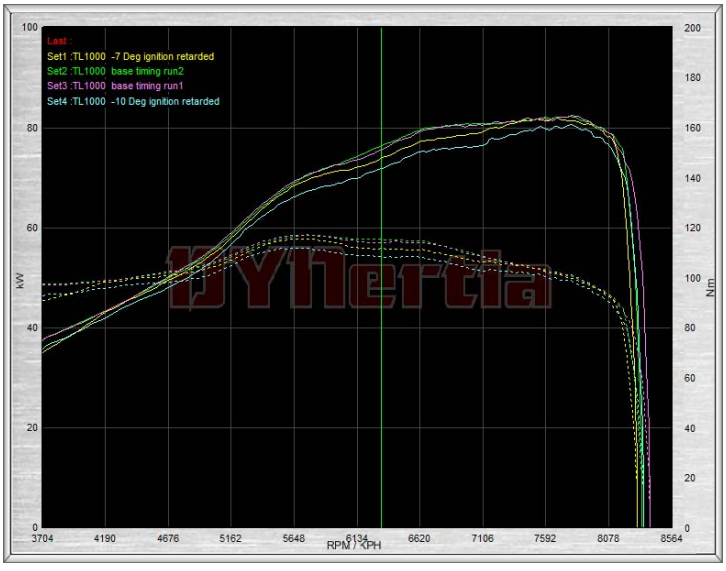


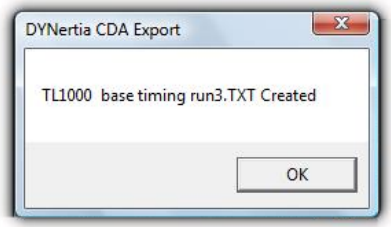
Export data-

Data tables can be exported into Microsoft Excel directly (with field headings included) or a general delimited text file (CDA) can be generated (exported files follow either Metric or imperial depending on the current operating mode). Alternatively the main graph image can be exported as a bitmap image ('.bmp') for further analysis and file sharing.





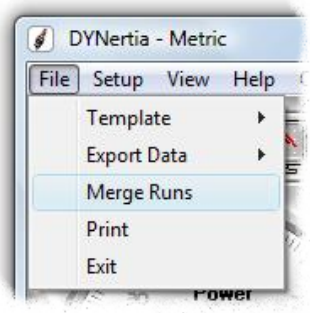




Menu Options 'File' (cont.)

Merge Runs-

Multiple runs can be 'merged' together to form a new 'averaged' run. This function is particularly useful when multiple runs have been performed and only slight variations exist, you may wish to create an average of these to smooth out the variations. Many testers do multiple runs after any modification to ensure consistency, merging compliments this practice perfectly.



A merged run will be based on up to 4 visible traces (2, 3, or 4). It is required that trace set "1" be loaded and visible as this is used as the 'master' when Dynertia generates the new data (any of your recorded comments will copy from this to the new file). The files merged will be all of the ones visible on the graph screen. The new averaged trace will be loaded as the 'last run' trace automatically. After the new averaged run is created you will be asked if you want to hide the other graph runs so only the new one remains visible.

Tip- The menu option "View/Clear Graphs" can be used to clear all of the graph traces so you can pick entirely new ones to merge if you wish.

Merge Displayed Traces
Merge Traces
Merge
Trace Set 1 MUST be loaded
At least ONE of Trace Sets 2,3, or 4 MUST be loaded to perform a Merge (Visible or Hidden)
A new, user specified file is created and loaded into the Last Run graph. Details of the source graphs are entered into the General Comments field of the Vehicle Information Database
STATUS
Trace Set 1 and another Trace Set required

The new 'averaged' run will appear as a complete data file and is treated just like any other run. The General comments field of the new files notes will automatically have appended a list of the files that it was generated from.

There are different methods used to indicate that a file is the result of merging multiple runs, depending on the screen-

An "M" symbol will appear next to the run when a 'graph summary' is viewed, 'File explorer' has a note on top of the preview graph, 'trace set information' screen has a note amongst the data and finally, when printing page 2 (run data) a reference is also made.

For indication purposes the weather correction data from the chosen runs is also averaged into the new weather fields as is the actual correction figure generated by them.

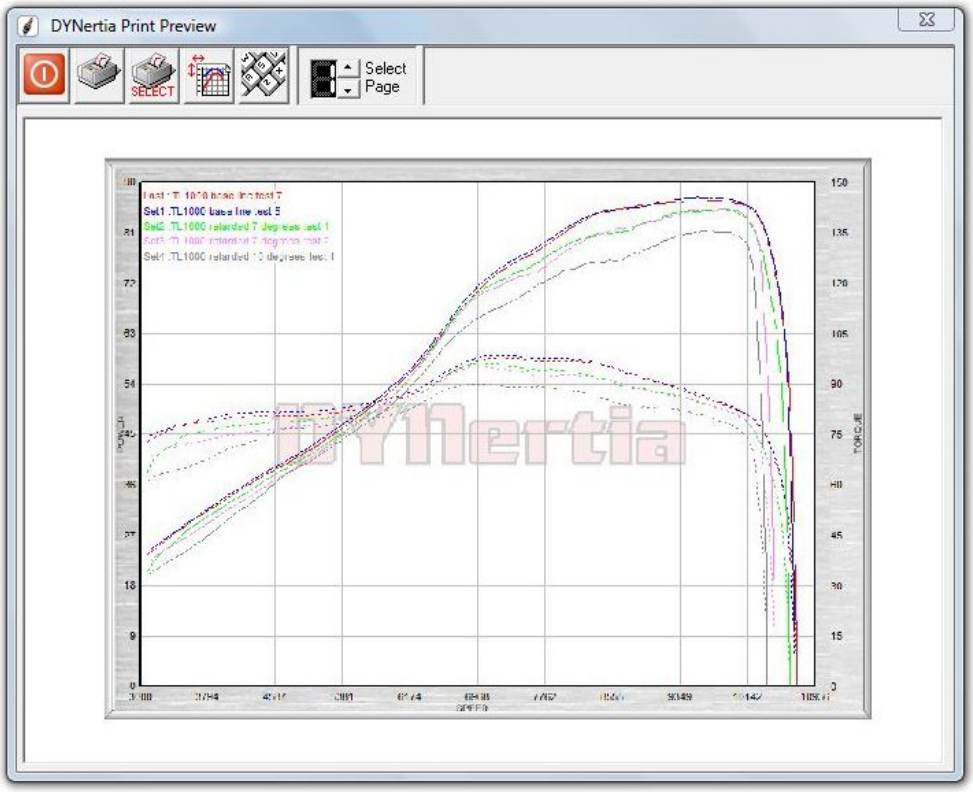
Tip- It is not suggested to merge runs that have been performed under different weather correction standards i.e. don't merge SAEJ607 runs with DIN 70020 etc. as the result will be meaningless for analysis, as will be the result if the original runs vary greatly from each other.

Menu Options 'File' (cont.)

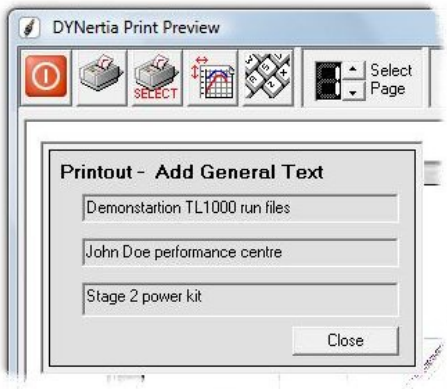
Print-

Allows previewing of the printout, the setup/selection of printers and the choice of pages to print (graph or data)

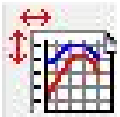
Tip- Printing follows the format of the main graph screen, scales and traces selected there are as printed.



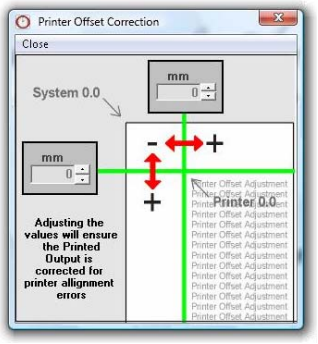
Information for Printed Output: Information entered here appears on the 2nd printed page (information page).



Print: Button will print the selected page.



Offset Correction: A trial print on A4 should be done first, If not aligned properly then this button will allow for the image to be shifted on the page when printed; most printers have a positioning error to some extent. When aligning, the image will not alter its position on the screen, only on the actual page printed.

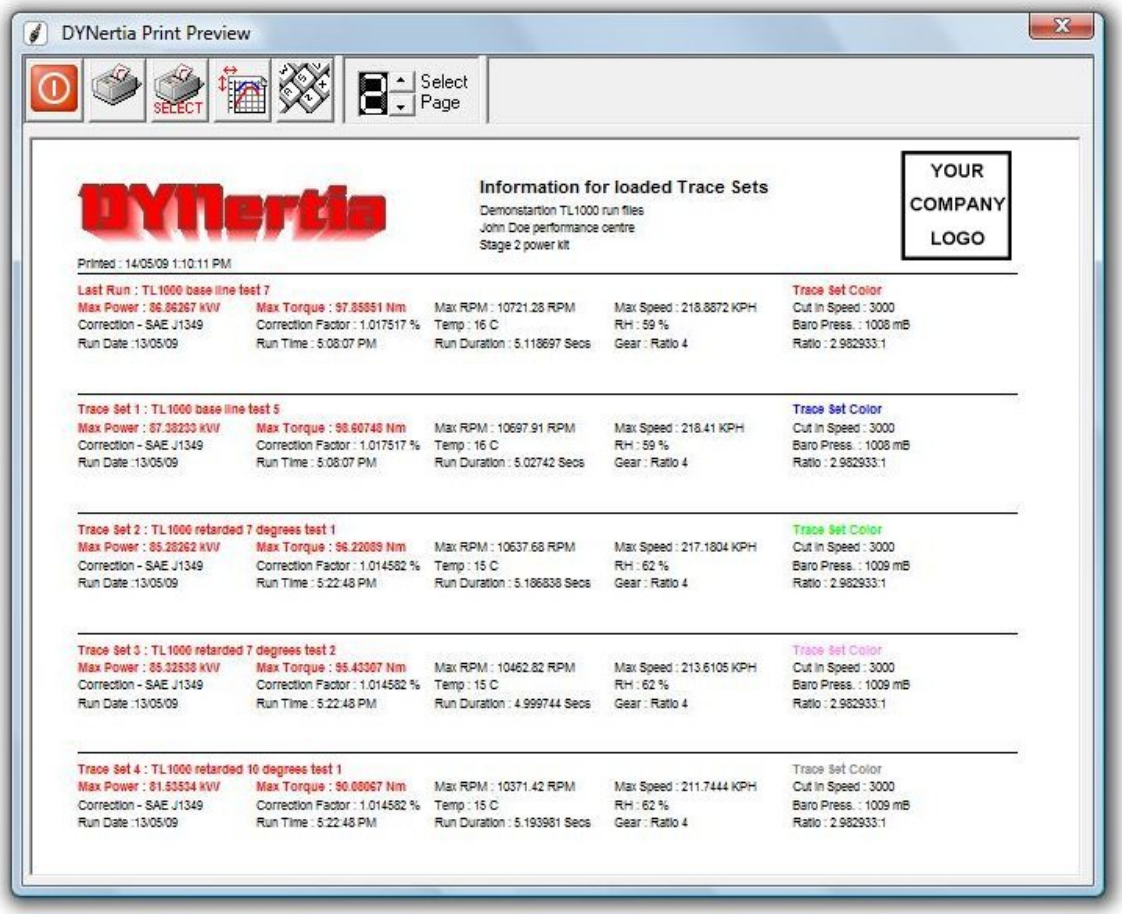


Select Page: Two pages are available for printing, a graph page that gets its image from Dynertia's main graph screen and an information page that shows key data from the selected traces on the graph.

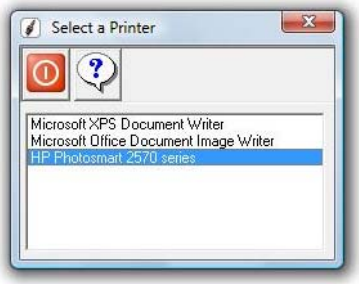
Menu Options ‘File’ (cont.)

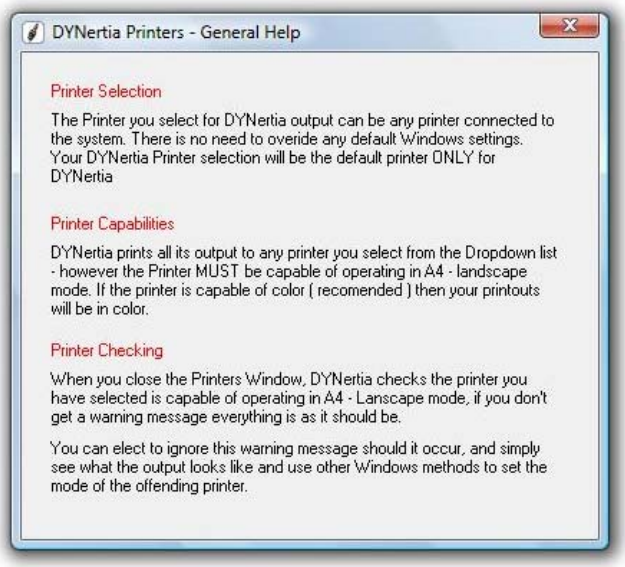
Print (cont.)-

The logo in the top RH corner can be user defined. It must be a JPEG image called “USERLOGO.JPG” and be located in the main Dynertia2 Folder (default directory location is C:\Program Files\Dynertia2), it should also be square in shape or it may be distorted when viewed.


DYNertia Print Preview
SELECT
Select Page
DYNertia
Information for loaded Trace Sets
Demonstartion TL1000 run files
John Doe performance centre
Stage 2 power kit
YOUR COMPANY LOGO
Printed : 14/05/09 1:10:11 PM
Last Run : TL1000 base line test 7
Max Power : 86.86267 kW
Max Torque : 97.85551 Nm
Max RPM : 10721.28 RPM
Max Speed : 218.8872 KPH
Cut In Speed : 3000
Correction - SAE J1349
Correction Factor : 1.017517 %
Temp : 16 C
RH : 59 %
Baro Press. : 1008 mB
Run Date :13/05/09
Run Time : 5:08:07 PM
Run Duration : 5.118697 Secs
Gear : Ratio 4
Ratio : 2.982933:1
Trace Set 1 : TL1000 base line test 5
Max Power : 87.38233 kW
Max Torque : 98.60748 Nm
Max RPM : 10697.91 RPM
Max Speed : 218.41 KPH
Trace Set 2 : TL1000 retarded 7 degrees test 1
Max Power : 85.28262 kW
Max Torque : 96.22089 Nm
Max RPM : 10637.68 RPM
Max Speed : 217.1804 KPH
Trace Set 3 : TL1000 retarded 7 degrees test 2
Max Power : 85.32538 kW
Max Torque : 95.43307 Nm
Max RPM : 10462.82 RPM
Max Speed : 213.6105 KPH
Trace Set 4 : TL1000 retarded 10 degrees test 1
Max Power : 81.53534 kW
Max Torque : 90.08067 Nm
Max RPM : 10371.42 RPM
Max Speed : 211.7444 KPH

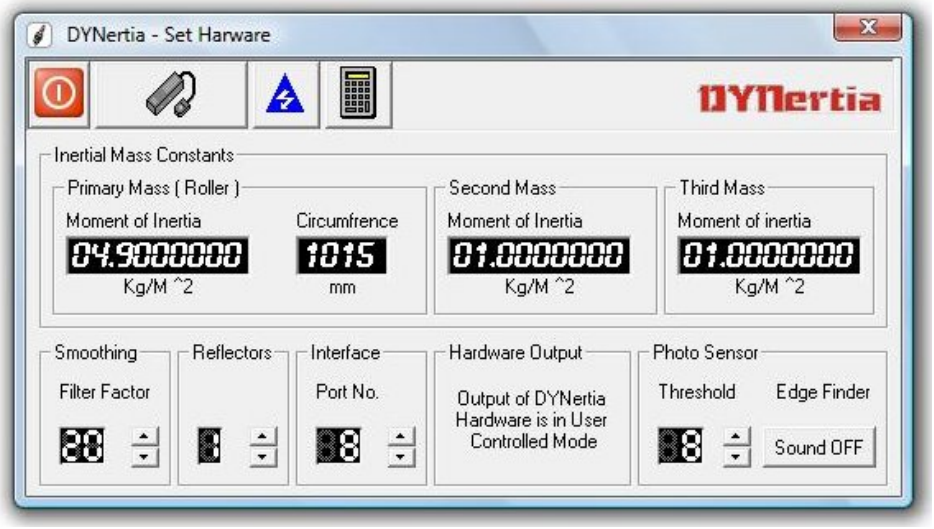
Select Printer: Select a printer to use with this button, a separate print ‘help’ menu is also revealed and this should be read!




DYNertia Printers - General Help
Printer Selection
The Printer you select for DYNertia output can be any printer connected to the system. There is no need to overide any default Windows settings. Your DYNertia Printer selection will be the default printer ONLY for DYNertia
Printer Capabilities
DYNertia prints all its output to any printer you select from the Dropdown list - however the Printer MUST be capable of operating in A4 - landscape mode. If the printer is capable of color (recomended) then your printouts will be in color.
Printer Checking
When you close the Printers Window, DYNertia checks the printer you have selected is capable of operating in A4 - Lanscape mode, if you don't get a warning message everything is as it should be.
You can elect to ignore this warning message should it occur, and simply see what the output looks like and use other Windows methods to set the mode of the offending printer.

Menu Options 'Setup'

Hardware-



Interface: Dynertia software needs to know which PC port the hardware has been allocated to. Unfortunately, when installing particular USB devices, modern PC's allocate them to almost any port number and will even change this depending on what USB socket is being plugged into.

The easiest way to set the "port No." is to plug in the hardware and press the 'AutoFind' Hardware button. It will step through all of the port options and try to establish communication with the hardware, be patient as 99 different options are catered for and this can take some time. When found, the port setting is automatically saved and should remain valid for the USB socket you have plugged into, if you use another socket you may need to search again.

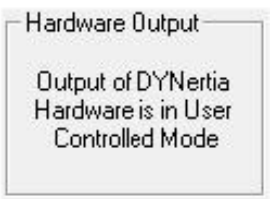
Tip- The communication port can also be manually chosen if it is known. Those with good computer skills can go into windows 'device manager' and view the hardware settings for ports (com & LPT) to check what the PC has done.

Inertia Mass Constants: The dynos **"Primary Mass"** (the main 'flywheel') inertial value is entered here (see www.dtec.net.au for a design tool and guide to assist in calculating if not already known). If the dyno design incorporates multiple selectable flywheels then their values can be entered in "**Second Mass"** and **"Third Mass"** to allow quick selection in main Dyno screen.

The roller '**Circumference'** is used for chassis dynos to allow speed in kph/mph to be displayed if required.

Hardware Output: Dynertia has an output pin allocated as either a 'brake' or 'user' output. In brake mode the output is 'Hi' (and symbol appears above dial gauges) for a settable time period after the run is ended, this can be connected to an automatic braking system (or brake cooling system). In user mode the output is operated manually from the menu option "Out On/Off", this can be used to operate engine cooling fans as an example.

The 'Brake/User' output button (blue triangle icon) will select the output is automatically controlled or is on/off by manual operation only. The panel will display either a location to enter the time delay that it's active for or a notice that it is in 'user' mode, depending on your choice.

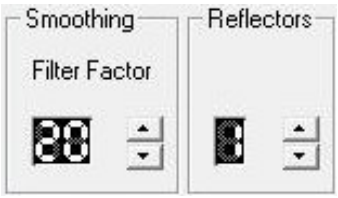


Note: The voltage, current ratings and further details for the output pin functions are outlined in the specifications section of this manual!

Menu Options 'Setup' (cont.)

Hardware (cont.)-

Smoothing: The 'Filter Factor' determines the level of smoothing applied to the data. This has the effect of displaying data that is not wildly changing due to small cyclic variations in engine firing and dyno mechanical tolerances. Too large a number and disturbances that may be of interest can be hidden (default is 20).



Reflectors: The number of reflectors measured per rotation of the flywheel. Normally only one reflector is used but it is possible to increase this number, however they must be positioned extremely precisely so it's not recommended. If this approach is used then perhaps it's better to sense off an accurate object such as holes in a sprocket etc.

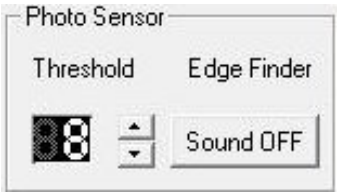
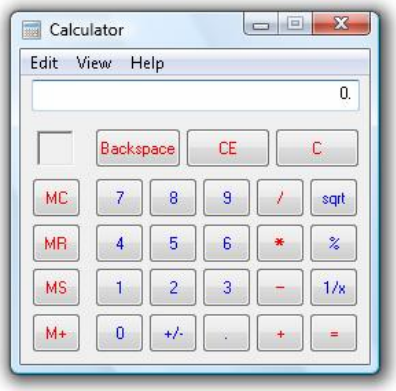


Photo Sensor: "Threshold" adjustment alters the optical sensors response to reflective and non-reflective surfaces. Higher numbers (range is 0 – 16) increase the sensitivity. For example, if the reflective surface being sensed has a poor finish (badly tarnished perhaps) then the sensor may not detect it without the sensitivity being increased. Care must be exercised when adjusting as an overly sensitive setting may cause triggering from surface features other than the reflector, like the background metal surface! Higher settings will also cause issues if there is direct light (eg. from a flood lamp) present when measuring.

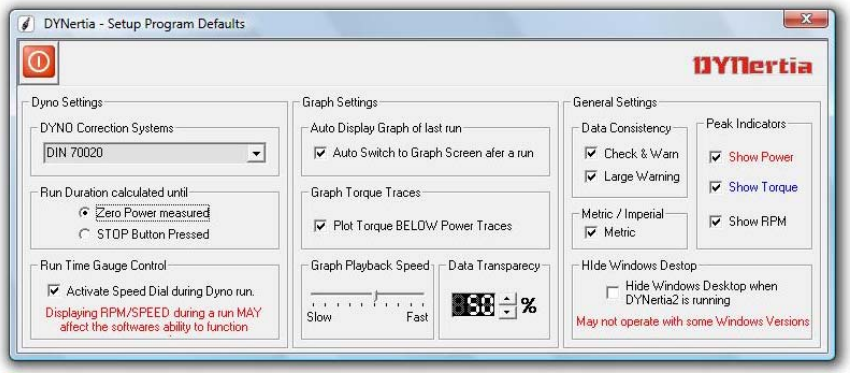
"Edge Finder" is an audible indication that the flywheel reflector is being detected, obviously your PC will need to have its sound system working to use this feature (don't forget to turn up the volume etc). Turn this feature off once finished using it for setup as it may impact on PC processing speed!

A calculator can also be displayed for general purpose usage.



Menu Options 'Setup' (cont.)

Software-



Dyno Correction Systems: This allows tests to be corrected to a standard set of atmospheric conditions for consistency as the environmental test conditions change. Correction to world standards SAEJ607, SAEJ1349, DIN70020 or uncorrected can be applied.

Run Duration Calculated until: Run time duration displayed in the data will start at the press of the "start run" button (or F12) and end at these two options, either 'stop' pressed or zero power detected.

Run Time Gauge Control: The rpm/speed dial gauge displays in 'real time' during a test if the option is enabled, this can have an effect on the operation at high rpm as it creates additional work for the PC (called processing 'overhead').

Auto Display of Last Run: When selected Dynertia will automatically open the Graph screen and add the test just performed to the set of traces.

Tip- If testing many times before analysing traces then it's faster with this function off!

Graph Torque Traces: The axis of the graph are automatically scaled, if you prefer the torque traces to sit below the power traces then select (graph scales can still be altered manually and override this setting). Feature is just a visual preference, traditional dyno graphs have the torque scaled lower when displayed.

Playback Speed: Sets the speed that the cursor will travel over the selected trace in the Graph screen when the 'play' icon has been pressed. This is for the automatic 'play back' feature outlined in 'graph screen overview',' graph controls'.

Data Consistency: Sets the warning that occurs when traces are loaded that were recorded with different sensor calibrations (only relevant when DataPAC is connected)

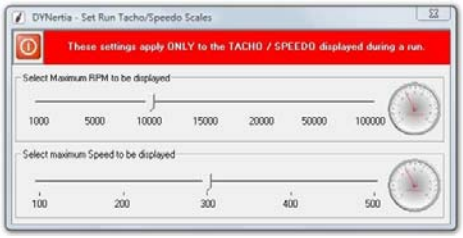
Data Transparency: Sets the transparency level of the 'floating' data box (used in "View/Single Trace Set" & also the main graph screen when the optional 'DataPAC' is connected)

Metric/ Imperial: Selects the units used by Dynertia, kph/Kw/Nm/ºC to mph/Hp/Ft Lb/ ºF etc.

Peak indicators: Dial gauge peak indicator 'tell tales' can be turned off for any gauge.

Hide Windows Desktop: Resets Windows 'desktop' for an attractive 'backdrop' when Dynertia2 is running.

Run Time Tacho ('Dyno' screen only)-



Sets the scale for the rpm/kph dial gauge only when displaying in 'real time'; when the 'Speedo/Tacho' or 'Set Ratios' buttons are pressed and during testing (if the menu option "Setup/Software/ Run Time Gauge Control" is enabled).

When the gauge is used for analysing graphs (showing the value at the cursor) its scale is automatically selected based on the scales used in the graph screen, not this setting.

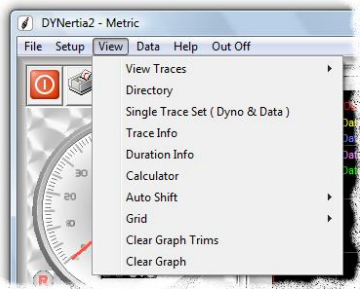
Trace Colours-

Trace set 1-4: Select any display colour from the pallet to associate with the trace set, it will be stored permanently. The colours chosen are also used for printing (on a white background), so keep this in mind and avoid very light colours if printing is planned.

Printer-

Selects a printer to use. Also accessed from menu option "File/Print", see this manual section for more detail if needed.

Menu Options 'View'

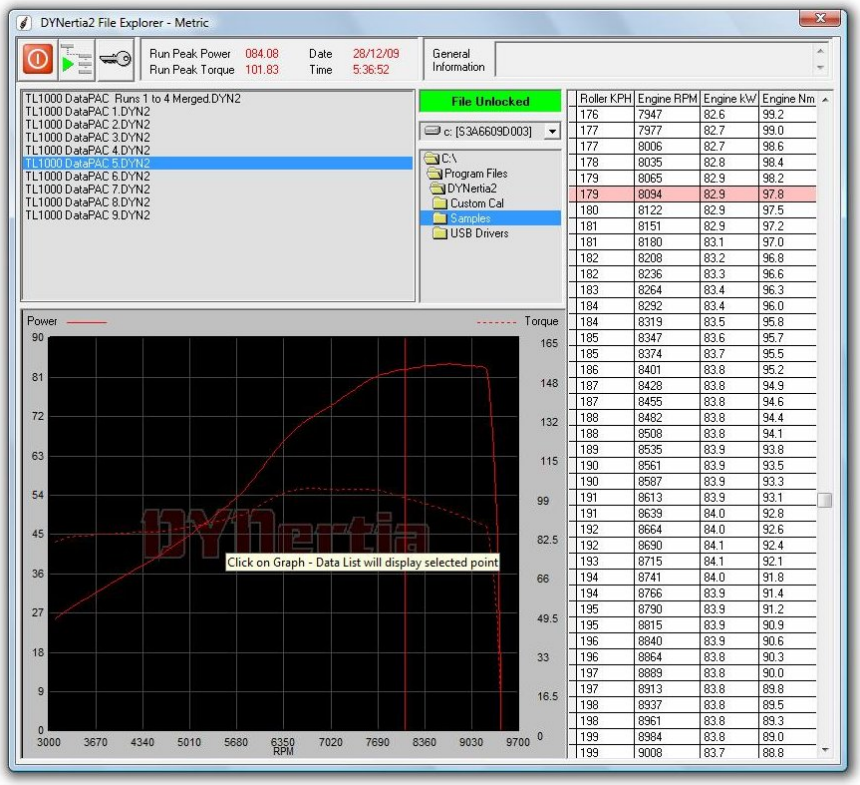


View Traces-

Selects the traces that are visible on the graph. Power and Torque default to visible.

Directory-

Opens the "File explorer" screen that is used to preview files, view data tables, lock files and alter the file path being used to save runs into. Accessing "file explorer" via this menu option (or the file path text shortcut on Dyno screen, p24) will open the folder that is set as the 'default' for saving files into, if you had opened this screen by selecting to load a new trace from the Graph screen (p27) then the folder will open that the current trace is stored in, which may or may not be the 'default'. You can alter the Default path at any time by pressing the 'File Storage' button outlined below.



Preview files by selecting and viewing the sample graph and data table; if the graph is clicked on then the values at the cursor will be also highlighted in pink in the data table (to the nearest data set) and vis versa.

Maximum data values, test time, date and notes stored in the 'general' section of the comments are indicated in the panel's header.

Tip- You can create and alter file names in 'Windows explorer' just as with any Windows program. Changing file names and locations whilst in use or selected will cause Dynertia to obviously produce error messages (it can't find them any more). You will need to re-select your files of choice from their new location. Do not rename the actual 'default' folder being used by Dynertia, an error will occur!

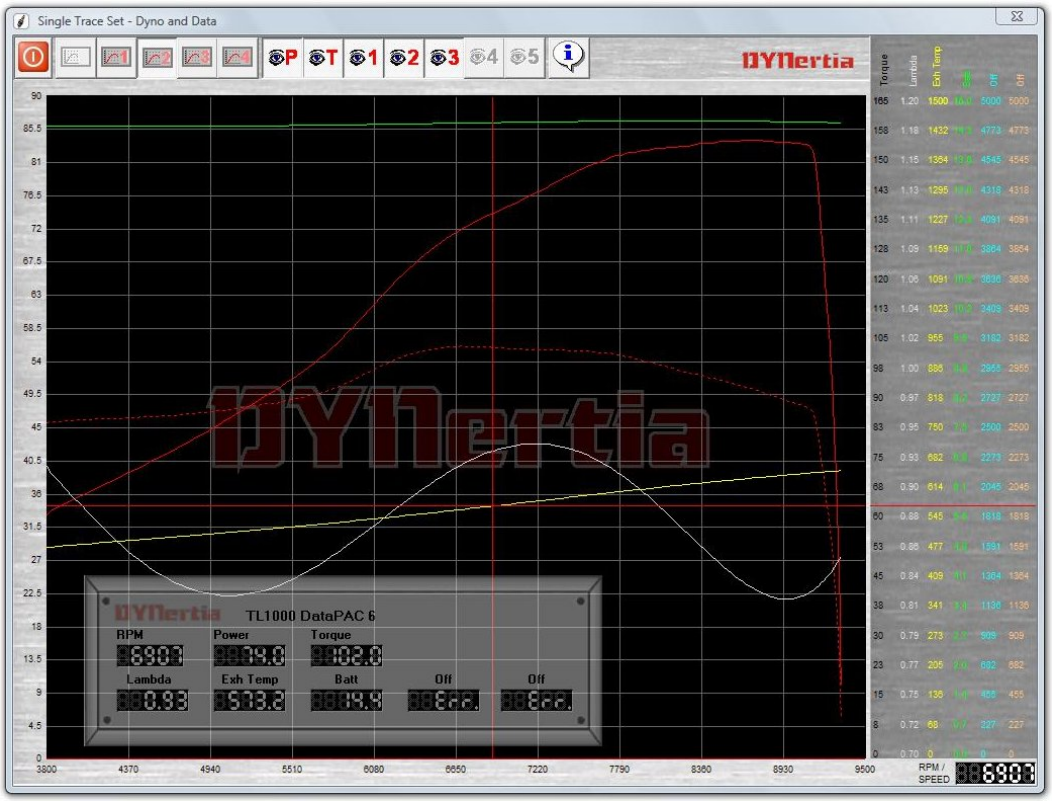
File Storage: This button will cause the folder that you have opened to preview (or to select from) to become the 'default' one that runs are saved into; its contents will also be shown on the main 'Dyno' screen.

Key: The 'key' symbol button will lock or unlock a file so that accidental overwriting can be prevented i.e. You won't be able to pick that file and re-save a test run over the top of it or modify comments. A locked file is indicated by a red box "File Locked", unlocked by green box "File Unlocked" (as seen above) when selected.

Menu Options 'View' (cont.)

Single Trace Set-

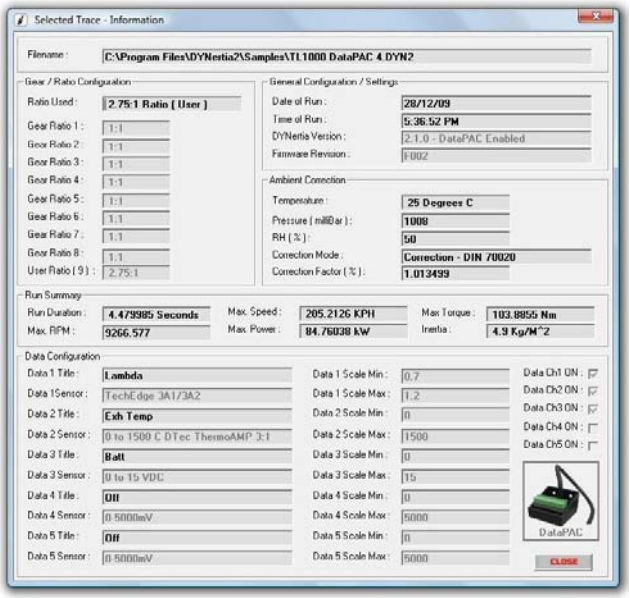
Opens a screen that shows the all of the available data for a single trace. Individual data channels for the chosen trace can be turned on/off ('eye' visibility buttons in the menu bar) and the trace being viewed can be from any of those loaded and selected into the main dyno 'graph' screen. Only available traces and their active data channels will have the buttons highlighted for operation!



Note: Images shown have channels other than just power and torque as the optional 'DataPAC' was used for data acquisition.

A floating data value box is activated by a 'click' in the right hand scale margin to turn on/off. Cursors are used to help analyse the information, position the mouse and 'click' on the graph. The cursor can also be 'dragged' by holding the mouse button down whilst moving over the graph.

Tip- The data value box's transparency level can be adjusted in the menu option "Setup/Software" so that it does not obscure the view behind it. The box can be freely dragged by its border to any screen position.



Information: This button will reveal a summary table of the data associated with the trace set being currently viewed.

Menu Options 'View' (cont.)

Trace Info-

Opens a screen that shows the key summary data for all of the loaded traces. See Graph screen overview, graph controls section of this manual for full details.

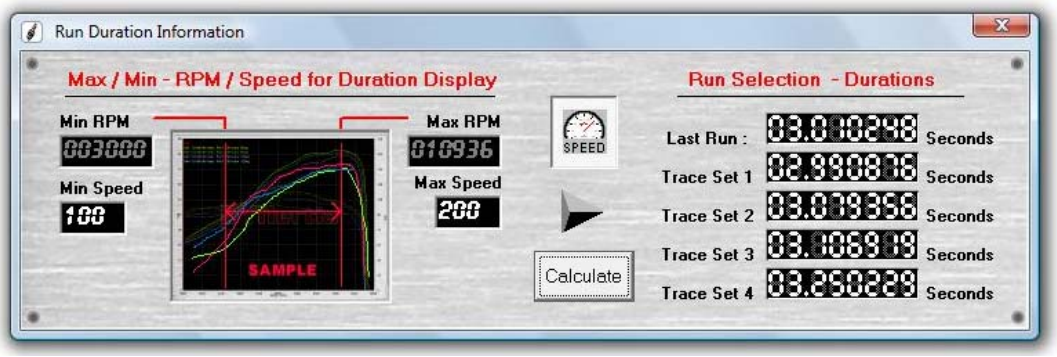
Tip- "**?**" button in the lower LH corner of a viewed graph is the shortcut.

	Filename	Cirrection %	Min RPM	Max RPM	Max Torque	Max Power
Last Run :	TL1000 base line test 7	1.017517	3000	10721.28	97.85851	86.86267
Trace Set 1	TL1000 base line test 5	1.017517	3000	10697.91	98.60748	87.38233
Trace Set 2	TL1000 retarded 7 degrees test 1	1.014582	3000	10637.68	96.22089	85.28262
Trace Set 3	TL1000 retarded 7 degrees test 2	1.014582	3000	10462.82	95.43307	85.32538
Trace Set 4	TL1000 retarded 10 degrees test 1	1.014582	3000	10371.42	90.08067	81.53534

Duration info-

Opens a panel that allows the selection of any two speed or rpm points and displays the time between them. See 'Graph screen overview', 'graph controls' section of this manual for full details.

Tip- "" Clock symbol button in the lower RH corner of a viewed graph is the shortcut.



Calculator-

Calculator is displayed for general purpose usage.

Auto Shift-

Setting 'Auto Shift' means that each time a new 'run' is performed that it's loaded as the 'last run trace' and the previous last run becomes trace number 1, trace 1 moves to trace 2, 2 moves to 3, 3 moves to 4 and 4 is removed from selection. This feature allows for the graph to always contain the latest runs.

Grid-

Allows the grid lines to be removed from the graph, this effects printing also as what is on the screen is what is printed.

Clear Graph Trims-

Clears all of the manual adjustments made to the graph scales and returns to the automatic scale selection.

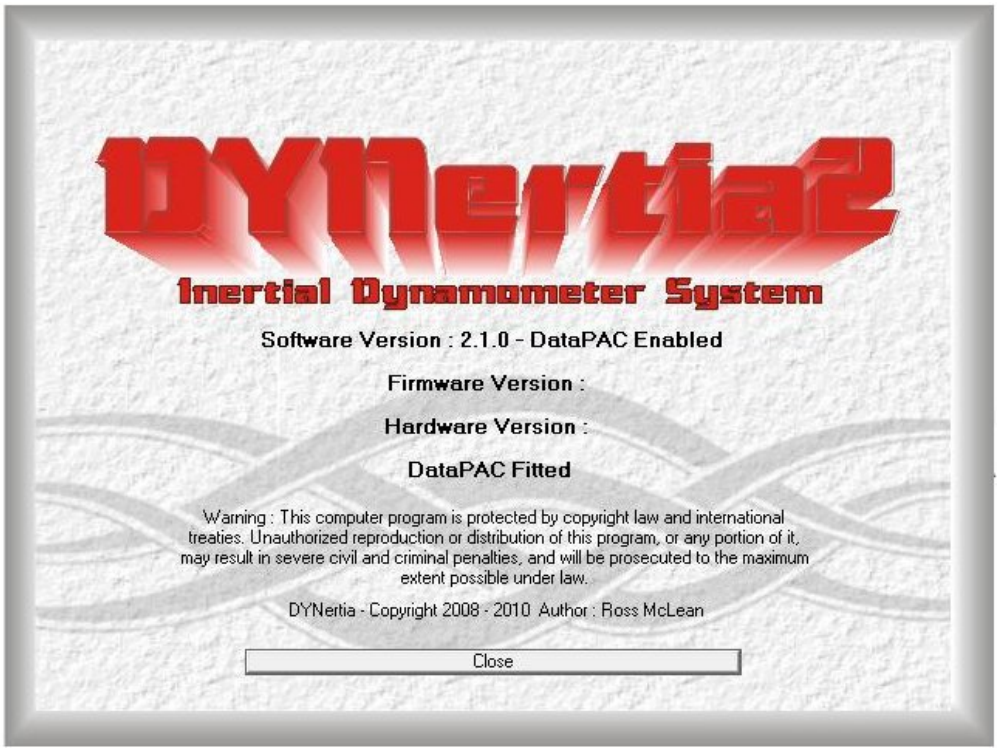
Clear Graph-

Clears all of the traces from the graph, ready for new ones to be loaded.

Menu Options 'Help'

About –

Displays Firmware version, hardware version and copyright information.


DYNertia2
Inertial Dynamometer System
Software Version : 2.1.0 - DataPAC Enabled
Firmware Version :
Hardware Version :
DataPAC Fitted
Warning : This computer program is protected by copyright law and international treaties. Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
DYNertia - Copyright 2008 - 2010 Author : Ross McLean
Close

Open Manual –

Opens the Dynertia manual, the manual must be in the 'Dynertia' directory for this function to operate. We suggest you download the latest manual version from the DTec web site (www.dtec.net.au) and simply save it in the Dynertia directory (default directory location is C:\Program Files\Dynertia).

Of course, you can just download the manual from our website, save it where you please and view as any other document!

Repair File –

This utility is capable of repairing some data base files in the unlikely event of corruption due to PC issues. No guarantees, but worth a try!

www.DTec.net.au –

Direct link to the DTec web site, access to the user manual and software information.

Menu Options 'Out Off/On'

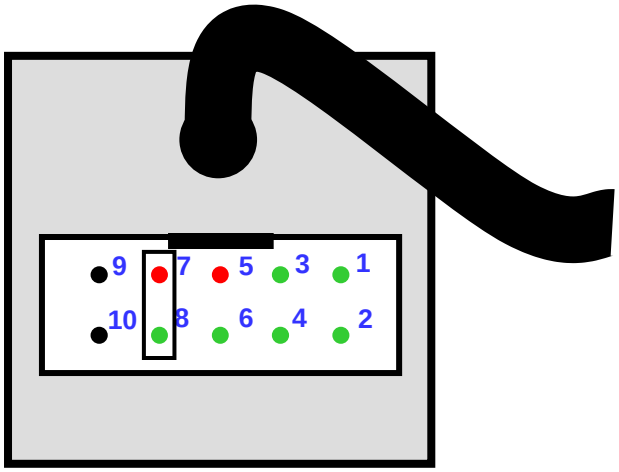
Dynertia has an output pin allocated as either a 'brake' or 'user' output in the menu option "Setup/Hardware" (see this section in manual for more details). In user mode the output is operated manually from this menu option (both the output and the menu text toggle) this can be used to operate engine cooling fans as an example.

The voltage, current ratings and further details for the output pin functions are outlined in the specifications section of this manual!

Specifications

Timer accuracy	± 1 microsecond at 21ºC
Maximum rpm	Tested to 150,000 rpm (single reflector), max is reduced to 35,000 with DataPAC
Minimum rpm	4 rpm approximately
Auxiliary outputs	25 mA can be sourced or sunk. 5V CMOS levels
Timer	Crystal oscillator
Technology	Digital, microprocessor based
Operating temperature	-35ºC to +65ºC
Communications	USB to computer
Power supply	Powered from computer via the USB connection
Sensor	Optical, infrared reflective transducer
Sensor focal length	3.8 mm optimally
Sensor sensitivity	Software adjustable threshold for contrast compensation

Wiring (pin allocations)-



1 Serial communications line
2 Brake / Aux output
3 Rotation detected output
4 N/A
5 5V Out
6 Serial communication line
7 5V Out, External link to pin 8
8 External link to pin 7
9 Ground
10 Ground

The digital port on the back of Dynertia is designed for future expansion by allowing the connection of external equipment; it has high speed serial data capability available. Several pins have been allocated to use as outputs if you wish. Pin 8 and 7 are to be joined by the 'shorting link' at all times.

NOTE: Outputs are digital 0V - 5V (CMOS levels), they can source or sink only 25 mA each. They are suitable for driving active loads such as solid state relays, conventional relays should only be driven via a suitable transistor. YOU HAVE BEEN WARNED!

1. 'Rotation detected' pin is Hi when the dyno flywheel is rotating above approximately 7.5 rpm or for as long as a run is being performed. This can be used for safety control systems or automatic fan controls.

2. 'Brake / Aux' pin is a timed output that can operate an automatic brake (e.g. eddy current) for slowing the flywheel down if you wish, or an automatic cooling fan for friction style brakes. The output goes active from after a run is indicated and remains Hi for a software adjustable time (menu option "Setup/Hardware"). The output can alternatively be operated by manually selecting ("Out off/on") If not allocated to a brake; this would be perfect for remotely turning on a cooling fan etc.

NOTES:

Keep track of important setup information here for future reference-

Primary Inertia Factor of Dyno:

_____

Inertia Factor of 2nd flywheel:

_____

Inertia Factor of 3nd flywheel:

_____

Roller Circumference:

_____

Gear Ratio of flywheel drive:

_____

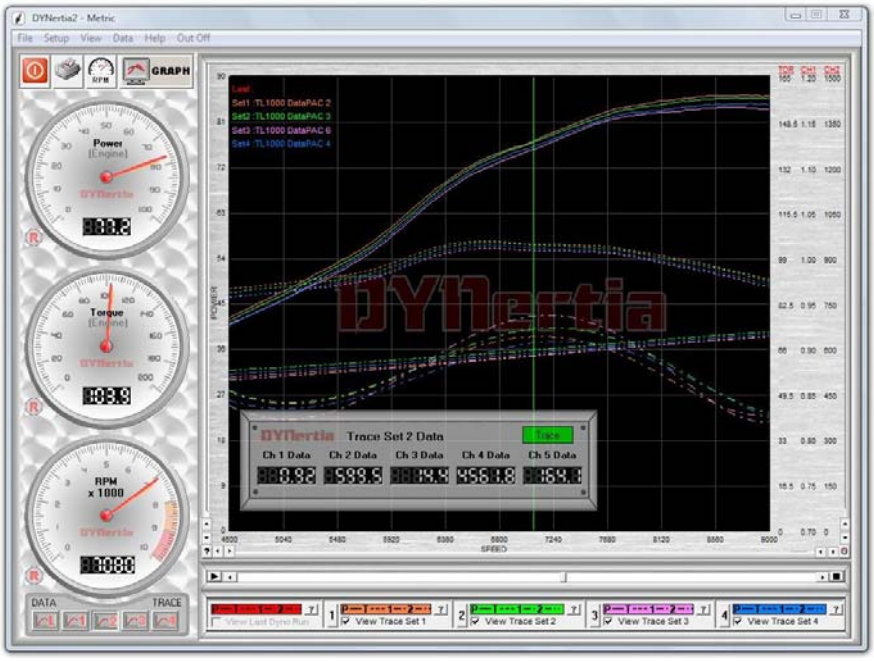
General Notes:

NOTE: The following manual section covers the optional DataPAC hardware specifications, connections and the additional Dynertia software features that are enabled when DataPAC is connected. Dynertia's main manual must be fully read first.

Supplement manual section for

DataPAC

Data Acquisition module for 'Dynertia' Dynamometer Systems



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Introduction

DataPAC is an optional accessory for DTec's 'Dynertia' dynamometer controller to allow data acquisition.

DataPAC is a 5 channel analogue input device (ADC) it sends the results from connected sensors to Dynertia for storing, viewing and analysing.

Perfect for connecting Dynertia to air/fuel ratio meters, temperature sensors, pressure sensors, throttle position sensors, voltage inputs etc.

DataPAC is plugged directly into the expansion port on the back of the Dynertia hardware and is automatically recognized by the software. Menus and functions are enabled to suit the extra data channels.

This manual covers the DataPAC hardware specifications, connections and the additional Dynertia software features that are relevant.

Features-

5 input channels provided for sensor voltage measurement ('common' ground)

Just plug DataPAC's lead into Dynertia's expansion socket and it's ready to use. When connected, Dynertia's software automatically recognizes it and enables extra menu functions to view, analyse, store and export the new data.

Dynertia can overlay 2 chosen data channels with the existing power and torque traces for display or all of the data for any trace can be shown in a single screen.

All 5 DataPAC channels are recorded with each run for analysis and their value at the cursor are shown in a floating 'data box'.

Simple screw type terminals on a removable terminal plug allow for quick and easy sensor wiring.

DataPAC is powered from Dynertia hardware so no additional supply is required.

A 5 volt output to power sensors and multiple ground terminals are provided for ease of connecting inputs.

Compact dimensions (45x45x30mm) for convenient mounting to dynamometer.

Fully encapsulated electronics provides maximum protection in the harsh workshop environment.

Features (cont)-

A 10 bit 0-5V analogue to digital conversion is used for high accuracy and a software offset is provided for reference voltage correction if required.

Dynertia software doesn't just display the input voltage measured, a table for each input allows it to be calibrated and displayed in any units you choose (eg Lambda, air/fuel ratio, degrees, PSI etc)

Linear sensors, such as the output from most Lambda meters, need only 2 values in the table for calibration. Setup values for common sensors (inc Lambda meters) are provided as defaults. DTec sensors such as 'ThermoAMP' and 'TS01' are ideal for measuring exhaust and engine temperatures and are also included as reference.

For non-linear sensors (like typical coolant temperature sensors) Dynertia uses a sophisticated algorithm to form smooth readings based on 3 calibration points you enter into the table. This gives you freedom to connect almost any type of sensor and get the readings in meaningful units.

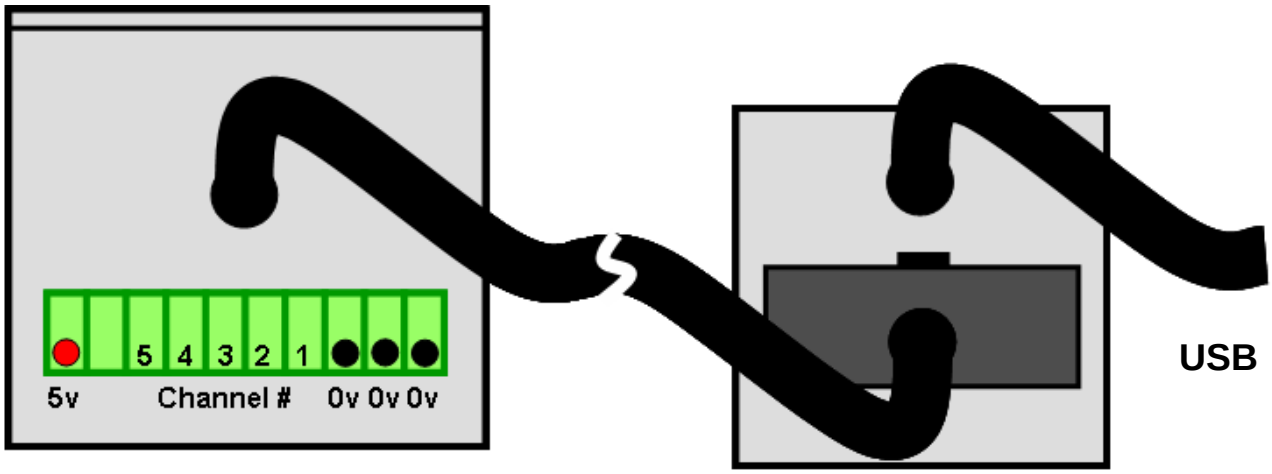
Hardware Setup

Hardware Connection-

Mount DataPAC in a convenient location. Consideration must be given to the length of lead that needs to be plugged into Dynertia and that the wiring should be routed well clear of any interference sources.

Strong vibration will destroy DataPAC (as with all electronics) so it is important to consider mounting arrangements that avoid this.

Remove the small jumper connection that is fitted standard in Dynertia's 10 pin connector (on the rear near the cable exit). Plug DataPAC's lead into Dynertia's connector.



DataPAC module **Dynertia module**

We suggest you secure the DataPAC cable and Dynertia's USB cable together near the connector to stop excessive force/vibration being applied and damaging the connection to Dynertia.

When Dynertia is started and communicates with the hardware it will notify of DataPAC connection.

Both DataPAC and Dynertia units derive their power from the USB port (this is common practice). The interfaces can run on USB1 or USB 2 ports. However, a small number of older USB 1 systems have limited power supply capabilities; this can be remedied by using a powered USB hub in this unlikely situation. The USB 5V supply can be checked across the 2 end terminals of the DataPAC connector.

Hardware Setup (cont.)

Wiring DataPAC -

DataPAC's 0-5V, 10 bit resolution allows voltage steps as small as 5mV to be measured but in practice its signal noise that limits this measurable voltage.

There are certain precautions that can be taken to maximise the performance and minimize the effects of interference-

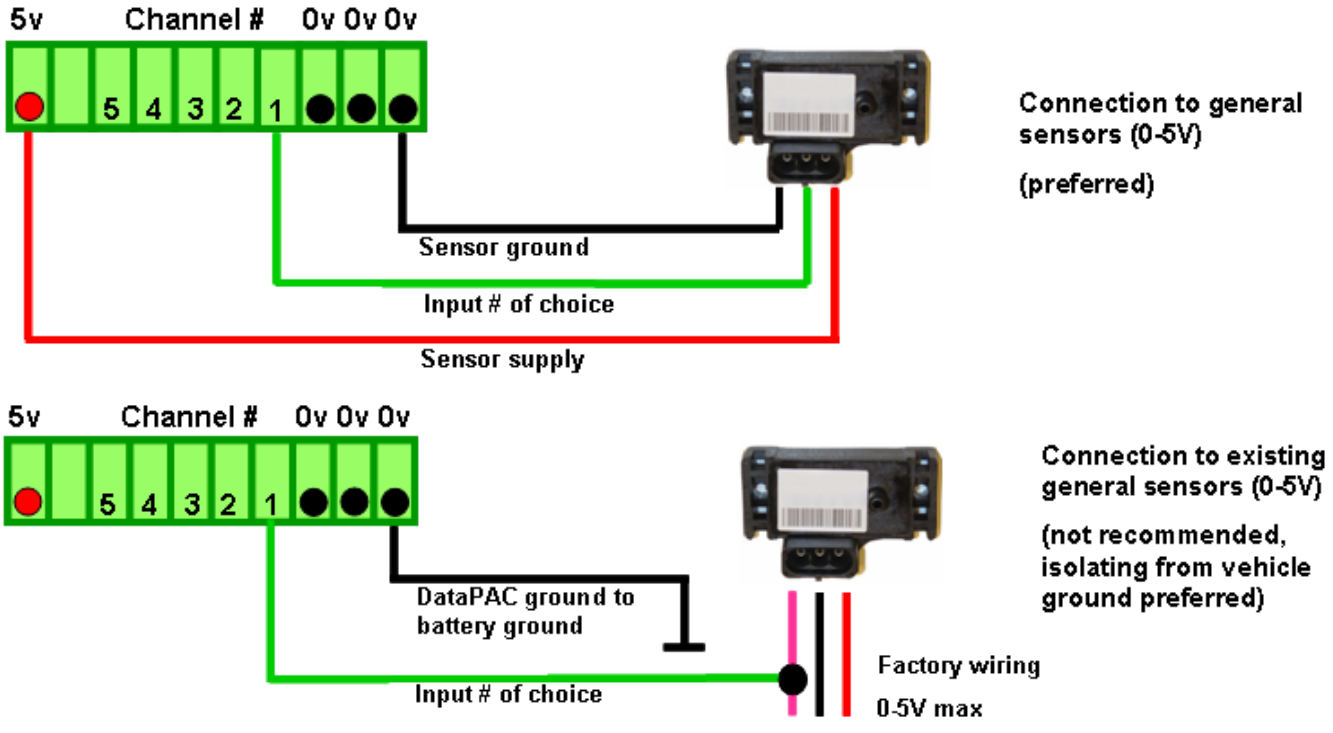
- Run all wiring well clear of any large current carrying wires (eg electric fans), mains leads and particularly high voltage sources such as ignition systems.
- Connect all grounds to a common point (star ground) as this will reduce voltage differences between sensors and the measuring system.
- Quality shielded wiring should be used for critical measurements.
- Vibration of a wire can produce small voltages (tribo-electric effect) so route and secure wiring well.
- It is best to avoid linking DataPAC into the vehicle/engine if at all possible, run sensors from an isolated supply source such as a spare battery. Sharing the vehicle ground/power is a major source of measurement noise and this should always be considered when performing data acquisition during vehicle testing.

Input channels measure 0-5V only, for higher voltages use a voltage divider as shown in the example below.

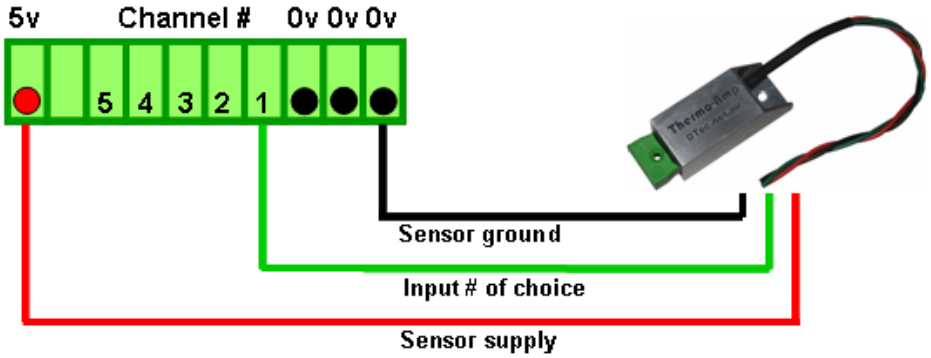
Screw type terminals must be tight or contact will be troublesome. To avoid loose connections, especially when wiring is frequently changed, we suggest fitting crimp ferrules to the wire ends.

Ground for DataPAC is linked to the PC so extreme care must be exercised to avoid connecting to equipment that can create ground currents (eg other mains connected equipment)

The 5V sensor supply is sourced from the PC's USB port so avoid excessive loading, refer to connection notes.

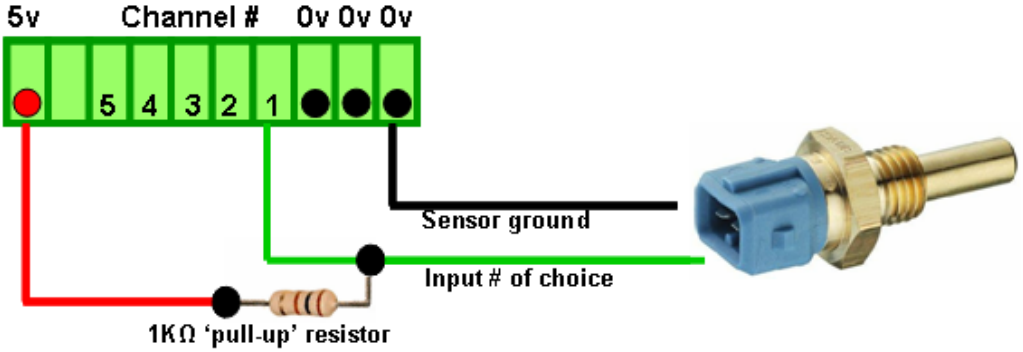


Hardware Setup (cont.)

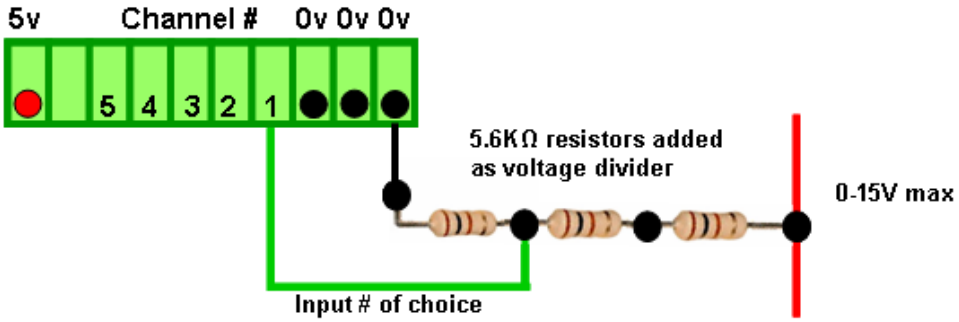


Connection to DTec 'Therm-Amp' and 'TS01' temperature sensors.

Note: For Thermo-Amp to read to 1200ºC the supply will need to be 12V and a divider used.

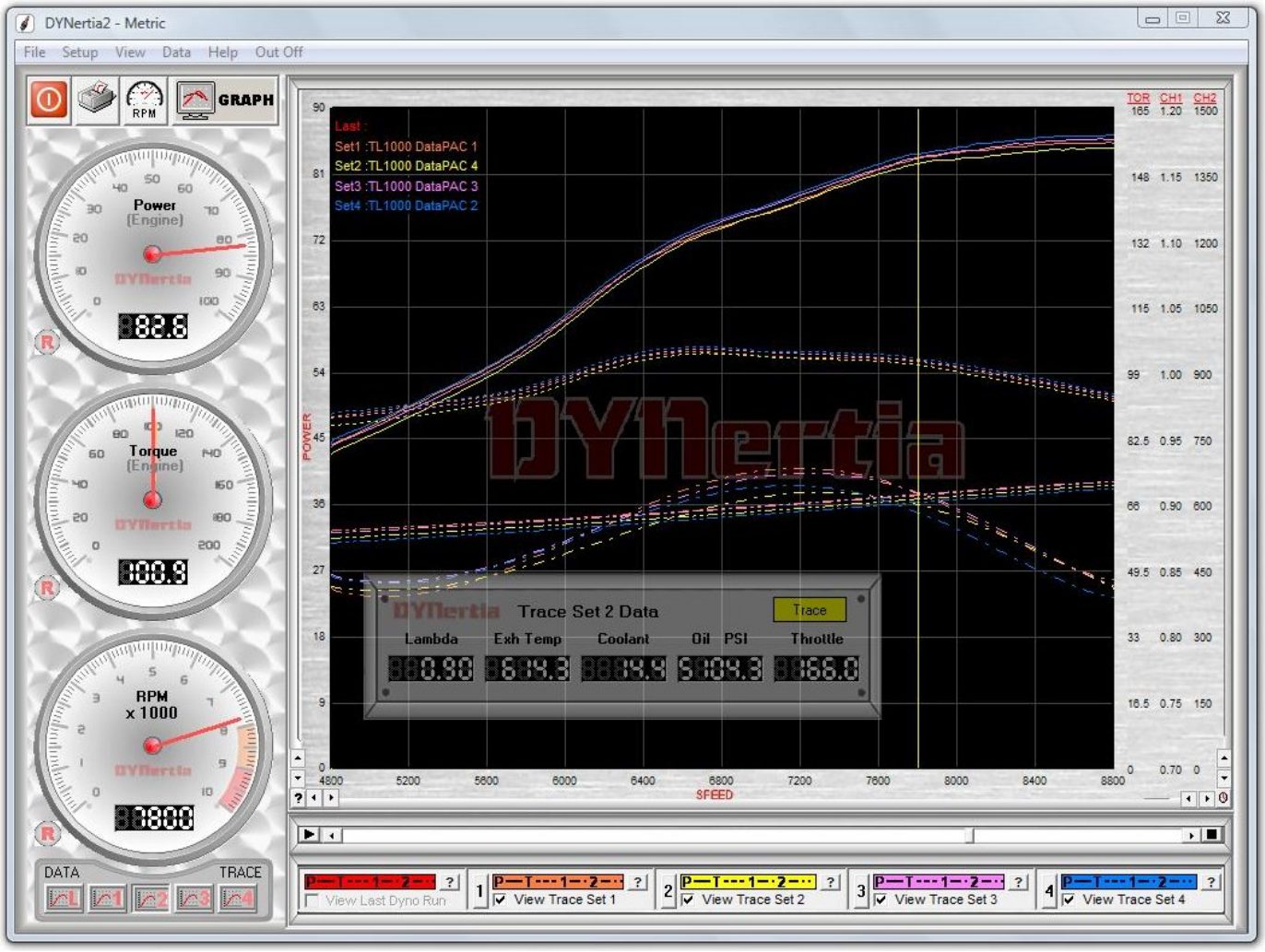


Connection to standard resistive temperature sensors.



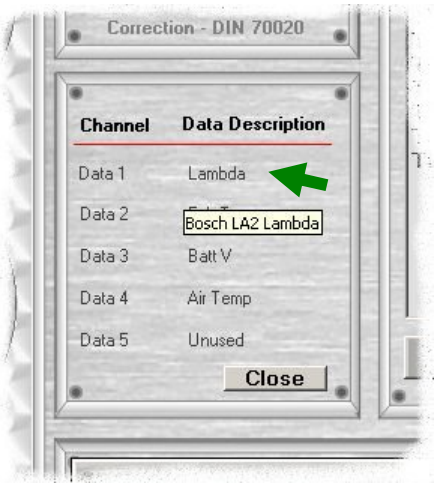
Connection measuring inputs that are greater than 5V (0-15V). Input voltage is divided by a factor of 3.

Dynertia Features with DataPAC Connected



Dynertia automatically detects DataPAC connection when Dynertia is first started, alternatively the menu option "Setup/Hardware" will initialise DataPAC. When DataPAC is detected changes occur in Dynertia to handle the additional data channels that it provides.

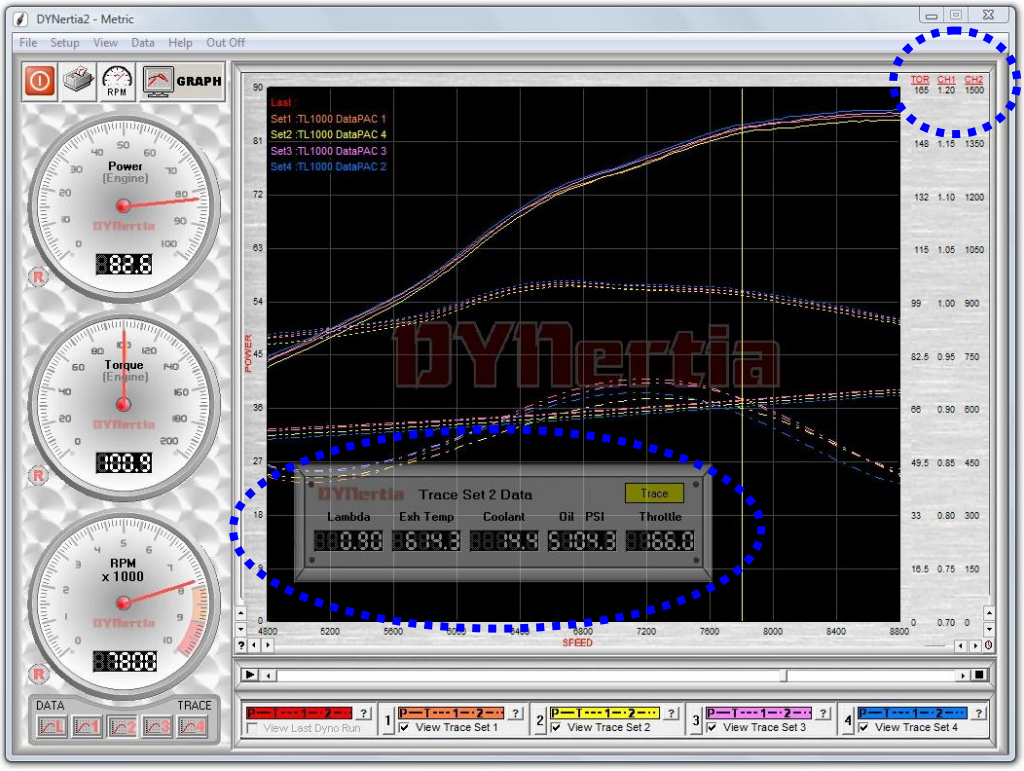
The connection of DataPAC is shown by the indicator lamp on the 'Dyno' screen showing green and not red.



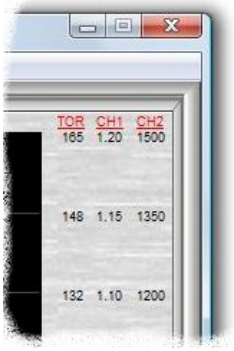
If the indicator lamp is 'mouse clicked' then a summary of the current DataPAC channels is shown, 'hovering' the mouse over any channel name will reveal the sensor calibration that will be applied.

Tip- If DataPAC is connected after Dynertia has already been started, and as long as the port setting is correct, just entering and then exiting the menu option "Setup/Hardware" will force Dynertia to check if DataPAC is connected!

Dynertia Features with DataPAC Connected (cont.)

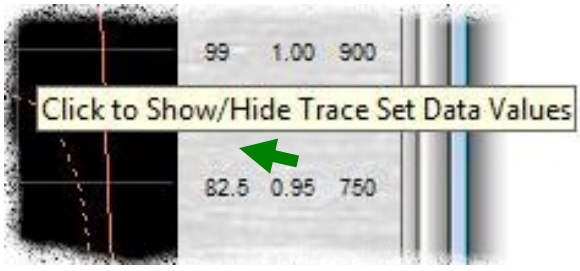


Traces for channels 1 & 2 of DataPAC appear overlaid on the graph (they can be turned off in the menu option “View/View Traces” if required).



The torque scale on the right hand side of the graph expands to include the scaling associated with DataPAC channels 1 & 2, not just torque.

Positioning the mouse over the "CH1" and "CH2" scale labels will reveal what channel description is being used i.e. "CH1" may be configured as Lambda so "Lambda" will be displayed.

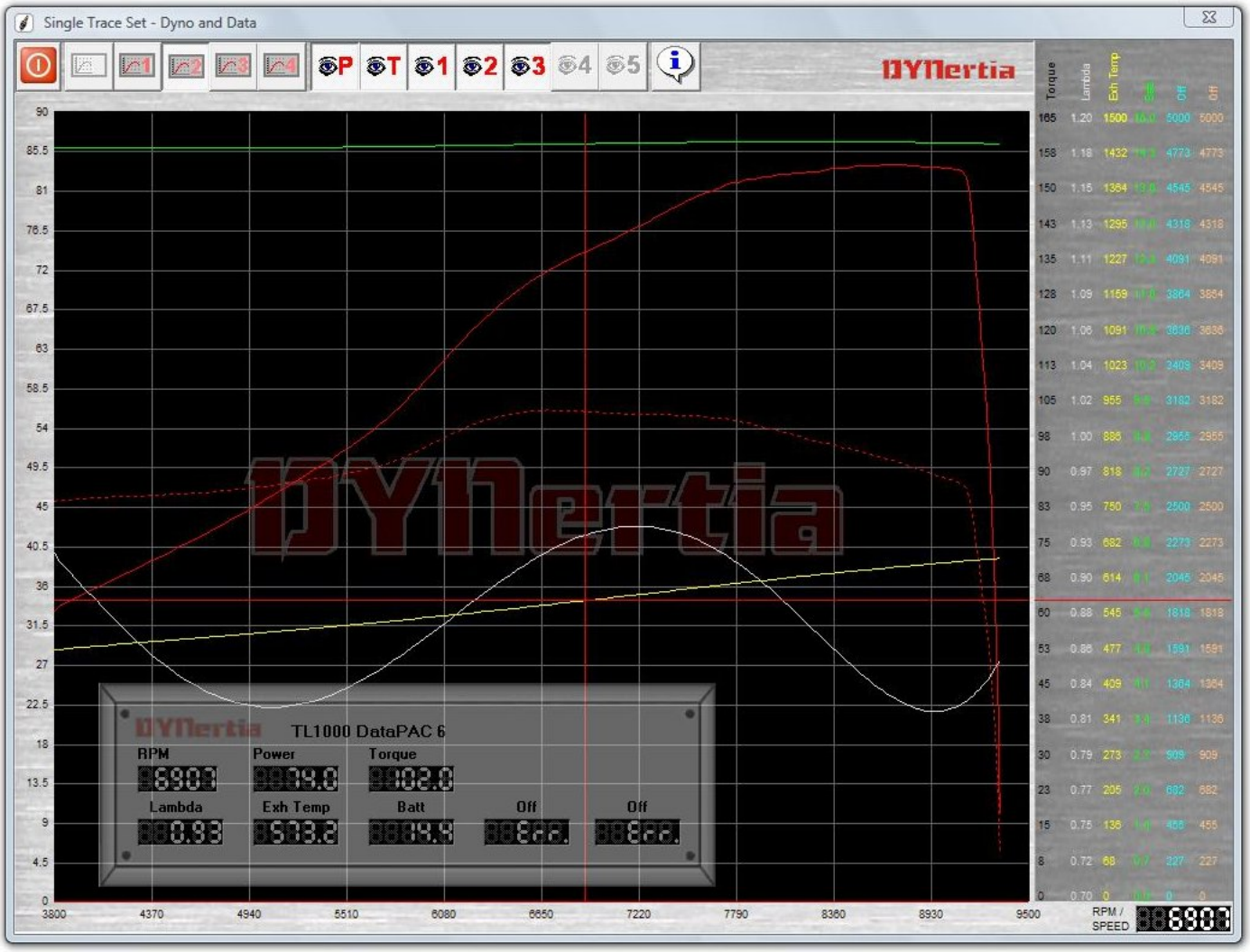


A 'floating’ data values box can be activated on the graph to show the values of all 5 DataPAC channels at the point marked by the graph's cursor.

The data box is turned on/off with a mouse 'click' over the right hand graph scale.
It can be 'dragged' by its border to any location ('click and drag' on the box's edge).

Tip- The data value box’s transparency level can be adjusted in the menu option “Setup/Software” so that it does not obscure the view behind it.

Dynertia Features with DataPAC Connected (cont.)

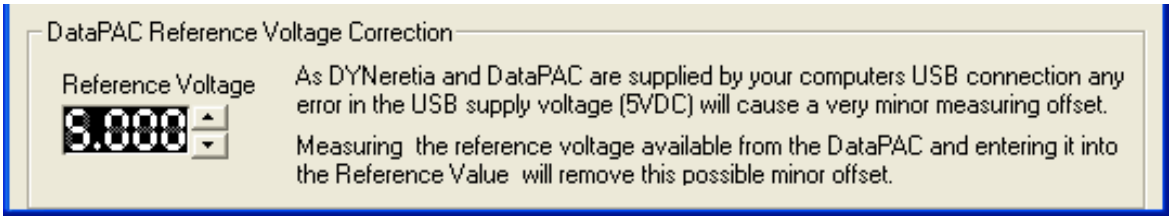


When DataPAC is connected the additional data channels appear in the “Single Trace Set” (in the ‘View’ menu). The 'floating’ data values box will show the values of all 5 DataPAC channels at the point marked by the graph's cursor.

As in the main ‘graph screen’ the data box is turned on/off with a mouse 'click' over the right hand graph scale.
It can be 'dragged' by its border to any location ('click and drag' on the box's edge).

Tip- The data value box’s transparency level can be adjusted in the menu option “Setup/Software” so that it does not obscure the view behind it.

Dynertia Features with DataPAC Connected (cont.)

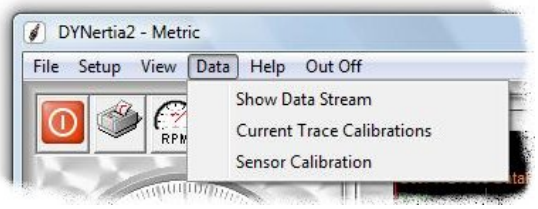

DataPAC Reference Voltage Correction
Reference Voltage
5.000
As DYNeretia and DataPAC are supplied by your computers USB connection any error in the USB supply voltage (5VDC) will cause a very minor measuring offset.
Measuring the reference voltage available from the DataPAC and entering it into the Reference Value will remove this possible minor offset.

When DataPAC is connected an additional hardware setup option is available (menu option “Setup/Hardware”) to correct for variations in the supply voltage from the PC's USB port to DataPAC. This adjustment is rarely required as the 5 volt from most PC's is very precise. Simply measure the voltage between the 2 end terminals on DataPAC (5V and ground) and enter the measured voltage.

Tip- This voltage can be also used to correct for sensor errors (if applicable to all channels), but this is really best done by modifying the sensor calibration table to 'trim' the result!

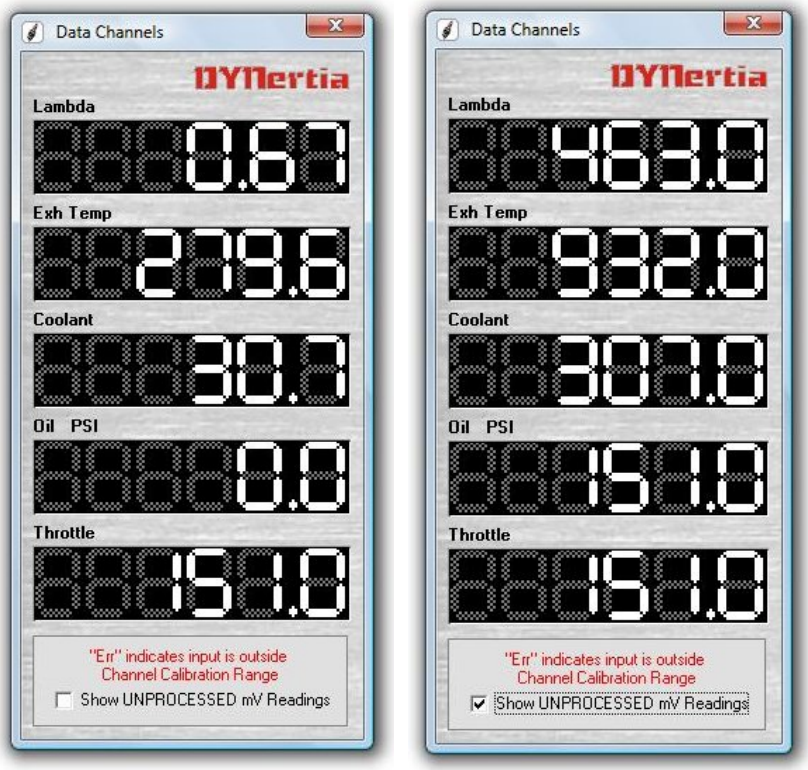
Menu Options ‘Data’

A new menu item called "Data" appears that contains the options required to configure DataPAC



Show Data Stream-

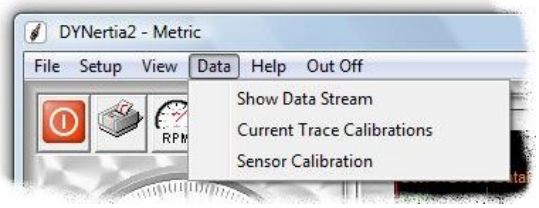
Allows all of the DataPAC channels to be displayed in a monitoring box, this is particularly valuable when wiring, calibrating and testing senor inputs.



The data shown can be in the actual units calibrated for the channels (i.e. channel 1 may be calibrated to show Lambda from a lambda meter), optionally by 'ticking' the box the 'raw' mV readings measured by DataPAC is displayed, this is prior to any sensor calibration being applied.

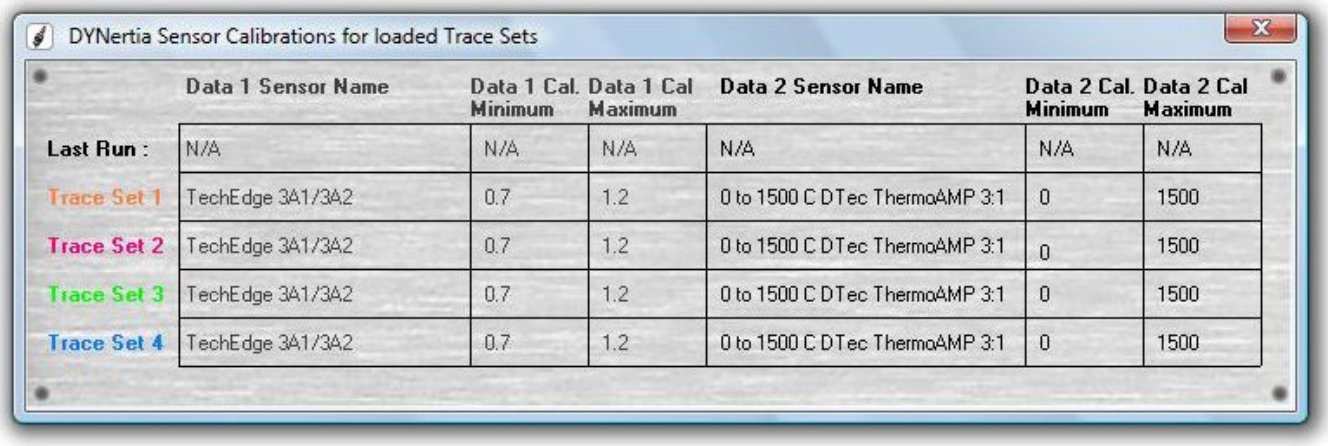
A red "Err" reading means the input voltage is outside the input range (0 - 5000mV) or if a sensor calibration is applied then the sensor reading is outside the range that has been calibrated.

Menu Options 'Data' (cont.)



Current Trace Calibrations-

This screen reveals a summary of the sensor calibrations and labels being applied for channel 1 and 2 (as these are the ones displayed on the graph screen). If there is an inconsistence detected between the calibrations from different selected traces then it will be highlighted here as to which trace and channel has been recorded with a different sensor calibration (compared to the lowest number trace).

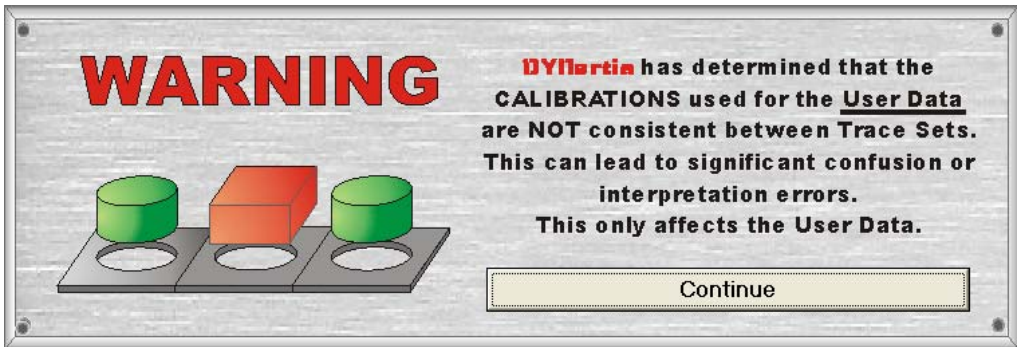


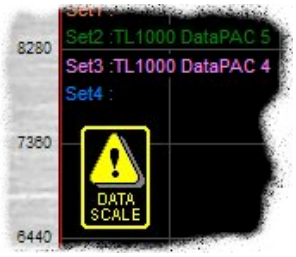
	Data 1 Sensor Name	Data 1 Cal. Minimum	Data 1 Cal Maximum	Data 2 Sensor Name	Data 2 Cal. Minimum	Data 2 Cal Maximum
Last Run :	N/A	N/A	N/A	N/A	N/A	N/A
Trace Set 1	TechEdge 3A1/3A2	0.7	1.2	0 to 1500 C DTec ThermoAMP 3:1	0	1500
Trace Set 2	TechEdge 3A1/3A2	0.7	1.2	0 to 1500 C DTec ThermoAMP 3:1	0	1500
Trace Set 3	TechEdge 3A1/3A2	0.7	1.2	0 to 1500 C DTec ThermoAMP 3:1	0	1500
Trace Set 4	TechEdge 3A1/3A2	0.7	1.2	0 to 1500 C DTec ThermoAMP 3:1	0	1500

For multiple overlaid traces to be meaningful then obviously they must all have been recorded with the same calibrations applied. If you choose traces to compare traces that have been recorded under different calibrations (i.e. if channel 1 is calibrated in Lambda for one test and temperature for another test) then you will be warned and an icon will appear on the graph screen to indicate this.

If you view the overlaid data after being informed of the inconsistency you must bear this in mind!

The extent of the warning can be altered in the menu option "Setup/Software/Data Consistency"

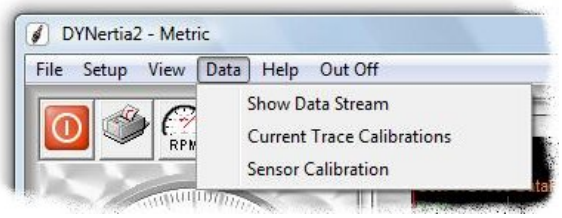

WARNING
DYNertia has determined that the CALIBRATIONS used for the User Data are NOT consistent between Trace Sets.
This can lead to significant confusion or interpretation errors.
This only affects the User Data.
Continue



When inconsistent data is viewed, the scales actually shown to the right of the graph (CH1, CH2) will be based on the trace set loaded into the lowest position (e.g. last trace recorded is highest priority, then trace 1, then 2 etc)

Tip- For consistency it is a good habit to use sensor calibrations that span the same range, for example if using different coolant temp sensor types then calibrate them all from, say 0 - 200 degrees (regardless of type), that way when data from the different tests is overlaid or merged it will still be valid!

Menu Options 'Data' (cont.)



Sensor Calibration –

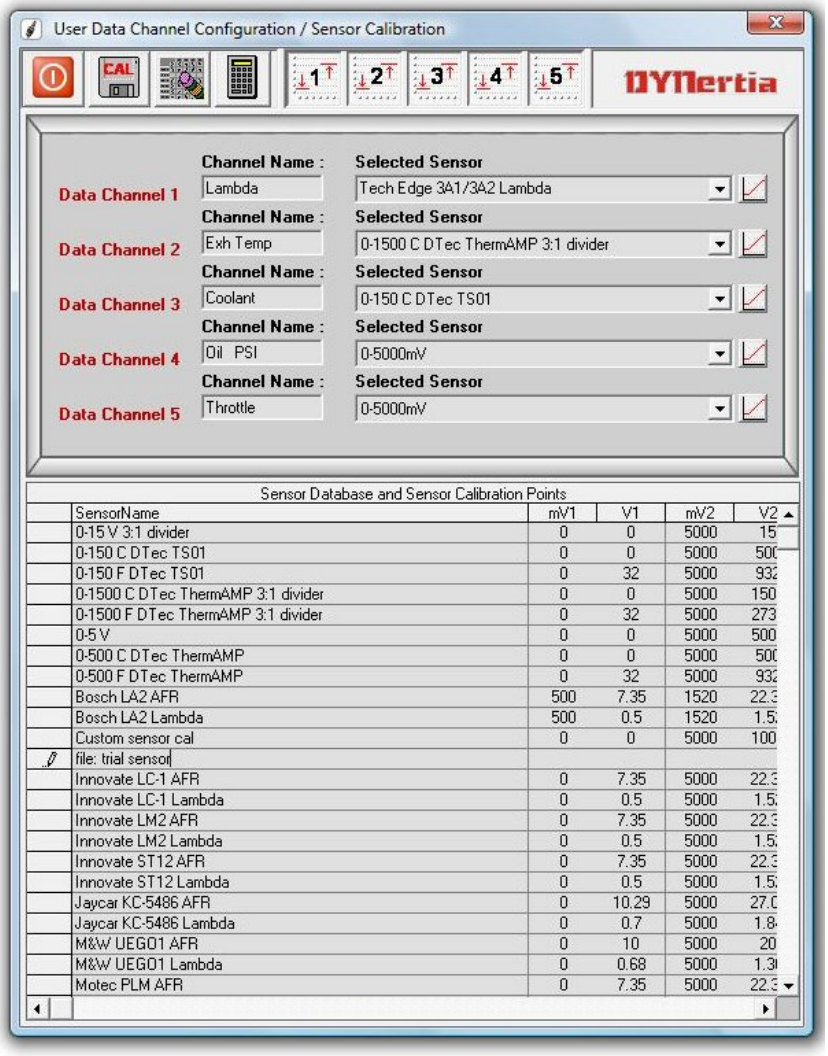
This allows the application of a sensor calibration to the input voltages that DataPAC is reading. The inputs can be read as plain voltages (1-5000 mV) if you wish, but generally an input voltage is easier to read if meaningful units are applied eg. The input from an air/fuel ratio meter could be shown in Lambda units rather than just millivolts.

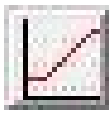
A delay can be applied to an input to try and offset sensor response times (often seen applied when monitoring air/fuel ratio). Unless you're absolutely certain you understand all the factors affecting the response time of a sensor, leave its delay set to the default of zero milliseconds.

Take for example a simple thermocouple in the exhaust. Not only is there a delay as the sensor body changes temperature, but changes in the operating conditions of the engine cause different gas velocities in the exhaust system resulting in different overall response times. The mechanical position of the sensor in the exhaust system is also another major factor and of course will vary depending on where the thermocouple is fitted.

Applying a calibration to a channel:

- Enter a meaningful name in the "Channel Name" field.
- Select the sensor from the drop-down list next to "Selected Sensor".





To optionally view the calibrations graphically press the button. This allows you to confirm your settings quickly.

Clicking on the presented graph will show the values at the cursor also (see next page)!

"Cal" button saves all of the selected calibrations against the channels and should be pressed before exiting.

If any channels have been altered you will be prompted to press this by a message box when you exit.

Menu Options 'Data' (cont.)

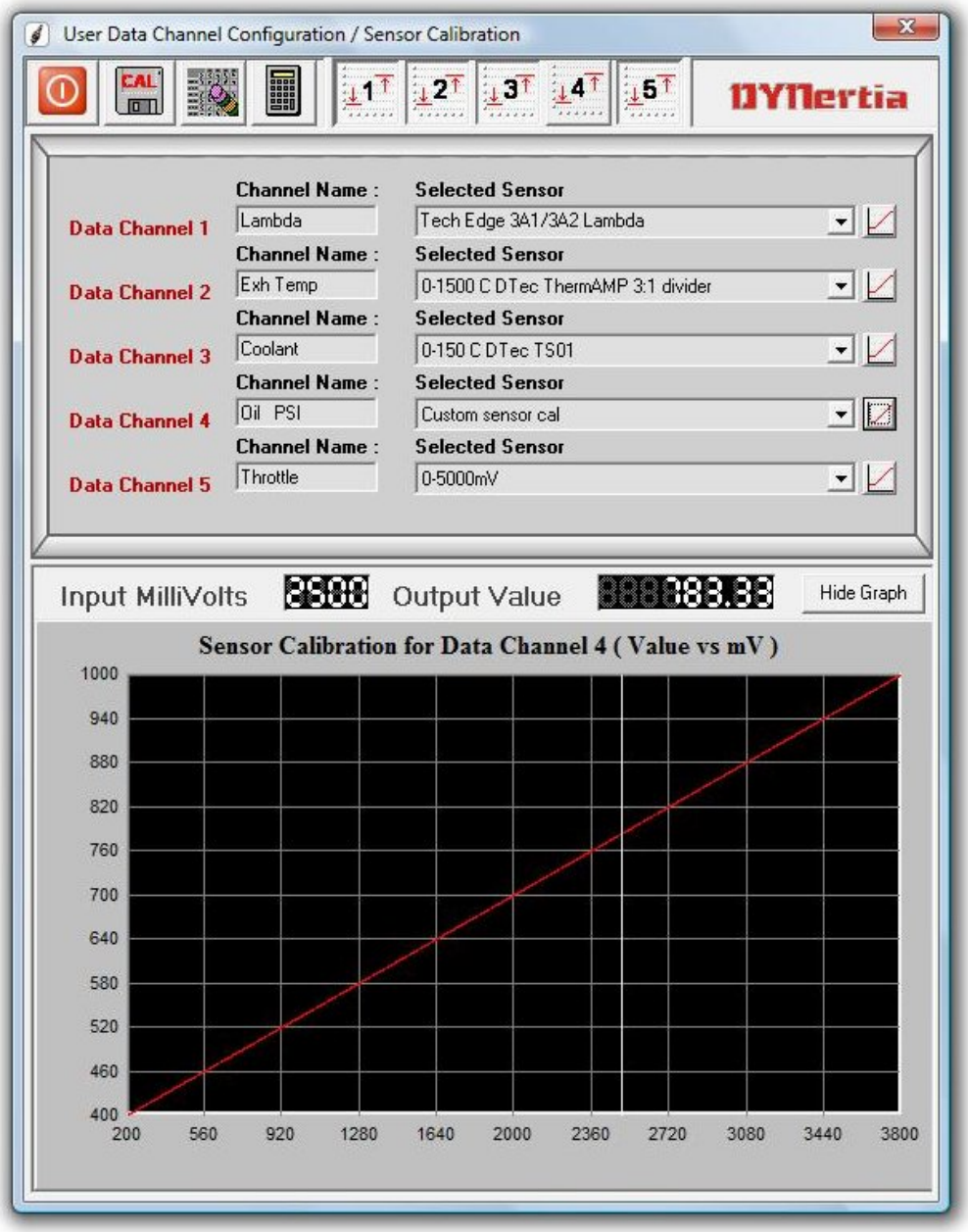
Sensor Calibration (cont.) –

There are many pre-set calibrations provided to select from but it is easy to create your own, here's how;

Creating your own linear sensor calibrations:

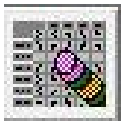
- Position your mouse in the last row of the data base list.
- Enter a meaningful descriptive name.
- Enter the minimum sensor input voltage in mV and the corresponding sensor reading to that voltage (eg 200 mV may be 400 psi of pressure from a particular sensor).
- Enter the maximum sensor input voltage in mV and the corresponding sensor reading to that voltage (eg 3800mV may be 1000 psi of pressure from the sensor).

	Tech Edge 3H1 Lambda	0	0.61	5000	1.29
▶	Custom sensor cal	200	400	3800	1000
*					



If you wish any voltage sensed below or above the calibrated input range to provide a fixed output reading then press the corresponding button.

For example, with the above figures any input voltage less than 200mV would result in 400 as an output and any input greater than 3800mV would result in 1000 as an output.



To delete a sensor from the list, select the sensor from the database list and use the erase button.

Tip- Sensor calibrations are ordered alphabetically, if you wish to position one at the top of the list then name it accordingly!

Menu Options 'Data' (cont.)

Sensor Calibration (cont.) –

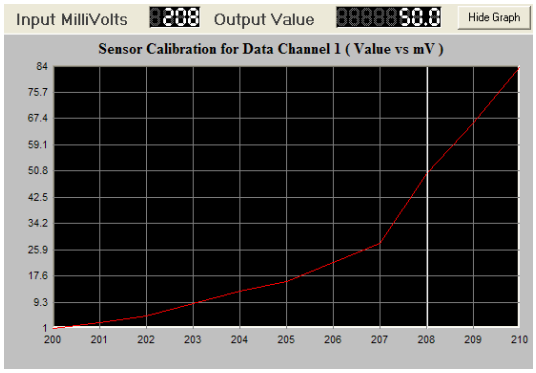
Certain sensors such as typical resistive temperature sensors are non-linear. These obviously require more than just 2 data points for calibration so Dynertia allows for the use of 'look-up' data tables to be used. There is an example file saved called "Demo.csv" in the "Dynertia2/Custom Cal" folder for your viewing/editing.

Creating your own non-linear sensor calibrations:

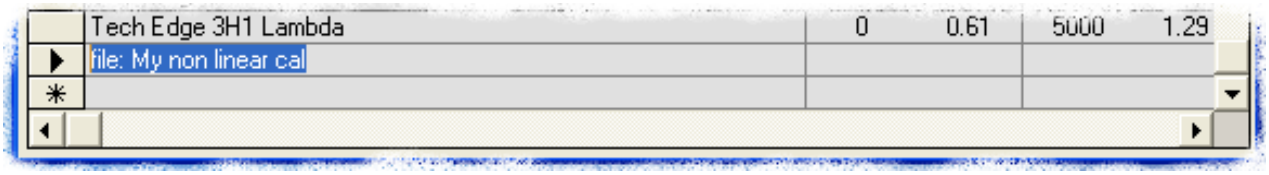
- You must create a 'CSV' (Comma Separated Variable) file, this can be easily generated in an Excel spreadsheet and exported as a CSV (any text editor could also be used).
- Save your file in the Dynertia2 folder called "Custom Cal" only.
- The file must have the mV reading in the first column and the sensor reading in the second column, separated by a comma.
- The mV readings must be contiguous (i.e. every mV step from your chosen min to max voltage must have a corresponding entry). The table does not have to start at 0mV or end at 5000mV, it can cover any range; just don't leave out any entries within the chosen range.

Example (lookup calibration table suiting 200-210mV input range and giving 1-84 as output range)

200,1
201,3
202,5
203,9
204,13
205,16
206,22
207,28
208,50
209,66
210,84



- To use your file you must tell Dynertia the file name in the sensor calibration field, this will then be used just like any of the other calibrations.
- The entry must start with the word "file" then a colon ":" and then your files name.



Tip- As the file name is used as the calibration description it helps to name it meaningfully

If there is an error found in the file, such as missing comma, missing data points or mV values out of range (0<>5000mV) then a warning message will appear and the channel will revert to default calibration settings (0-5000mV) to avoid issues with using corrupted look-up table data.

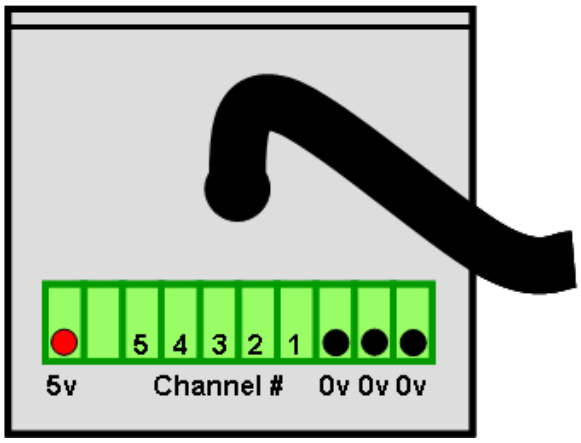
Please Wait
Because of the error in your Custom Calibration File, DYNertia is resetting its sensor table for the selected Data Channel back to the default 0 - 5000mV setting.

(A warning message will alert of any missing data points when the calibration button is pressed)

Specifications

Channels	5 analogue inputs, common ground
Input voltage	0-5 Volts (resistive divider easily extends range if required!)
Resolution	5mV, 10 bit analogue to digital conversion
Reference	Supply sourced, software compensation (or offset) can be applied
Input impedance	Greater than 10KΩ
Technology	Digital, microprocessor based
Operating temperature	-35ºC to +65ºC
Communications	Proprietary high speed interface to Dynertia
Power supply	Powered from computer via the USB connection
Dimensions	Approximately 45 x 45 x 30mm

Wiring (pin allocations Left to Right)-



5V output for supplying sensors
N/A (timer input for future use)
Channel 5 input
Channel 4 input
Channel 3 input
Channel 2 input
Channel 1 input
0V Ground
0V Ground
0V Ground

Note: all grounds are common (internally connected)

General Notes: